Cetaceans 4th Grade Curriculum

This curriculum was designed in 2011-2012 by Drs. Maia McGuire and Ruth Francis-Floyd, and was reviewed in 2013 by Cheryl Bonnes. The intent is to have 4th grade teachers integrate these lessons into their regular curriculum. Lessons are designed to take approximately one class period each (exceptions are noted in the lesson descriptions). Lessons are listed in the suggested order; however each is a stand-alone lesson that could be taught independently of the other lessons. Sunshine State Standards and Common Core Standards are provided for each of the lessons (as appropriate). [Next Generation Science Standard correlations are forthcoming]. Comments on the curriculum should be sent to Maia McGuire (mpmcg@ufl.edu).

Objectives: To learn about the biology and ecology of cetaceans (whales and dolphins), especially the North Atlantic right whale; to learn ways that humans impact and can protect cetaceans.

Outline:

Lesson 1: Starting to learn about whales
- Students will learn about cetaceans by reading the book, *The Wild Whale Watch*
- Students will keep a reading journal.

Lesson 2: What makes a whale a whale?
- Students will learn about general whale and dolphin biology and will use their knowledge of new vocabulary to complete a vocab worksheet

Lesson 3: Researching individual whale and dolphin species
- Students will play a modified game of Bingo to learn about individual cetacean species.

Lesson 4: How big are cetaceans?
- Students will show the lengths of difference cetaceans using a "whale-o-meter." Math activities include creating a life-size drawing of a cetacean and estimating the weight of an orca at different ages.

Lesson 5: Scientific names--understanding where those funny words come from
- Students will use Greek and Latin roots to interpret the scientific names of some whales. They will create a hypothetical cetacean and give it an appropriate scientific name.

Lesson 6: Whale behaviors
- Students will learn about behaviors that many whales can be seen doing. They will make whale puppets and use them to model different whale behaviors.

Lesson 7: How do whales eat?
• Students will learn about the differences between how baleen and toothed whales feed. Students will learn how sound waves are used for echolocation.

Lesson 8: Food chains
• Students will learn about food chains and conduct a food chain activity.

Lesson 9: How Do Whales Stay Warm?
• Students will investigate the roles that insulation (blubber) and body shape play in preventing heat loss in marine mammals.

Lesson 10: Summarizing what we know about cetaceans.
• Students will learn about different types of poetry and will write poems to express what they know about whales and dolphins.

Lesson 11: Focusing on North Atlantic right whales
• Students will learn about NARW life histories by using resource materials to complete worksheets

Lesson 12: Identifying individual North Atlantic right whales
• Students will learn about the New England Aquarium's right whale database and will try to match photographs to drawings of individual right whales

Lesson 13: North Atlantic right whale migration
• Students will learn about right whale migration and ways that right whales are being studied

Lesson 14: Why have right whales been hunted?
• Students will learn about historical whaling activity

Lesson 15: How do right whales communicate?
• Students will learn how baleen whales use sound to communicate and how human-created noises in the ocean may affect them
• Students will conduct an activity to simulate whale communication and interference by human noise

Lesson 16: North Atlantic right whales and boat strikes
• Students will learn why ships are such a threat to North Atlantic right whales and will conduct an activity to explore different ship/whale scenarios

Lesson 17: How can we protect North Atlantic right whales?
• Students will learn about ways to minimize ship strikes and whale entanglements
• Students will explore ways that they as individuals can help protect North Atlantic right whales.

Lesson 18: Technology and North Atlantic right whales.
• Students will learn about the ways that technology is being used to study North Atlantic right whales

These lessons are available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Lesson 19: Bringing it all together

• Students will develop a persuasive essay about the need to protect right whales, and will give a presentation based on the essay.

Dr. Maia McGuire is the Florida Sea Grant Extension Agent for St Johns and Flagler Counties. Dr. Ruth Francis-Floyd is an IFAS Extension Veterinarian at the University of Florida’s Fisheries & Aquatic Sciences Program. Cheryl Bonnes is a marine mammal outreach specialist with NOAA Fisheries.
Lesson 1: Let’s Start to Learn About Whales

Objectives: Students will start to learn about whales by reading a chapter book. Students will practice reading comprehension and writing skills by keeping a reading journal.

What you will need:

- Copies of “My Reading Journal—The Wild Whale Watch” (one per student)
- Optional: Copies of *The Wild Whale Watch* Word Search (Page 1-3 and 1-4. This could also be used as a review activity later in the curriculum—e.g. after lesson #10.)

Standards: CCSS.ELA-Literacy.W.4.1; CCSS.ELA-Literacy.W.4.2; CCSS.ELA-Literacy.W.4.3; CCSS.ELA-Literacy.RL.4.3; CCSS.ELA-Literacy.RL.4.4; CCSS.ELA-Literacy.L.4.6

Sunshine State Standards: VA.4.C.1.1; VA.4.S.3.2

Strategy:

1. Give students copies of the reading journal. Explain that they will be completing parts of the journal as they read *The Wild Whale Watch*, and parts when they have finished reading the book. Review the journal and explain the expectations and grading rubric.
   a. Students will stop reading at the end of chapter 1 and will complete the first writing assignment (prediction).
   b. While reading the book, students will select words that are important to the story and will write those words on sticky notes. They will choose three of the words and complete the second writing assignment using these words.
   c. The students will pay attention to the setting of the book—where is it taking place? Is the story occurring in the past (history), present or future? They will describe these in the third writing assignment.
   d. Students will draw a scene from the book, showing the main setting and labeling important characters and landmarks in their illustration.
   e. After finishing the book, students will complete a fourth writing assignment.

2. Explain that you will read the introduction to the book to the class, and ask them to help you select a word or words from the introduction to write on sticky notes. Explain that the word(s) they select should be important words for the story.
   a. Read the two-page introduction. Ask the students if there is a word that they heard you read that they think might be important to the book [e.g. whale]. Tell them that they can make this their first sticky note word.

3. Have students read *The Wild Whale Watch* either individually, or as a class. The following list is a suggested way to break the book into sections for daily reading.
   a. Chapter 1 = 9 pages
      i. Complete first writing assignment in the journal (could be done as homework or in class)
   b. Chapter 2 = 11 pages

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
c. Chapter 3 + 4 = 10 pages

d. Chapter 5 + 6 = 14 pages

e. Chapter 7 = 8 pages

f. Chapter 8 = 11 pages

g. Chapter 9 = 12 pages

i. Complete the second and third writing assignments in the journal.

4. **Optional:** Review the words that students selected in the second writing assignment. Select words to add to your word wall (if you are using one in the classroom). Words might include the following:
   - Baleen, Blowhole, Blubber, Bow-riding, Breaching, Callosities, Dolphin, Flukes, Lobtailing, Plankton, Radio, Spy hopping, Submarine, Whale

5. **Optional:** Give students the word search worksheet to complete. Alternately, this could be saved for closer to the end of the curriculum and used as a review.

6. Explain the four choices for the final writing assignment. Ask the students to select which of the choices they would like to write about. (Alternately, select one of the options for all of the students to write about.)
   a. Have students create a pre-writing plan for their assignment in the space provided in the journal.
   b. Have students write and revise a draft for their assignment. The suggested grading rubric is based on creative writing; however, teachers may wish to create additional grading rubrics to address correct use of standard language conventions (spelling, punctuation, grammar etc.).

**References:** The reading journal was modified from “My Summer Reading Journal: A Summer Reading Program of the Appoquinimink School District Incoming 4th & 5th Graders” accessed from: http://www.sleschool.org/ourpages/auto/2008/6/19/1213897707521/LM_Full_4-5_Packet.pdf
The Wild Whale Watch Word Search

Solve the clues below to figure out what words are hidden in the word search puzzle, and then find the words in the puzzle!

- A humpback whale is a ___ _A_ ___ ___ ___ ___ whale—it feeds on plankton and does not have teeth.
- Whales breathe through one or two ___ ___ ___ ___ _H_ ___ ___ ___ _S_ on the top of their heads.
- _B_ ___ ___ ___ ___ ___ helps keep a whale warm in cold water.
- Dolphins like to play in the water that is churned up by the front of a boat. This behavior is called ___ ___ W-___ ___ ___ ___ ___ ___.
- ___ ___ ___ _C_ ___ ___ ___ ___ is the name used to describe the behavior when whales leap head-first out of the water. They usually make quite a splash!
- Right whales have thickened patches of skin that look white on their heads. Scientists can identify individual right whales by looking at their ___ ___ ___ _L_ ___ ___ ___ ___ ___.
- Bottlenose ___ ___ ___ _P_ ___ ___ ___ ___ are toothed whales that are often seen performing in marine parks.
- A whale’s tail is made up of a pair of ___ ___ _U_ ___ ___ ___.
- ___ ___ _T_ ___ ___ ___ ___ ___ is the name given to the behavior where whales slap their tails on the surface of the water.
- ___ ___ ___ _K_ ___ ___ ___ is a mixture of tiny plants and animals; it is eaten by baleen whales.
- People in different submarines can talk to each other using a _R_ ___ ___ ___ ___.
- Whales sometimes stick their heads up out of the water and look around. We call this behavior ___ ___ ___ _I_ ___ ___ (2 words).
- Students in The Wild Whale Watch used a ___ ___ ___ _M_ ___ ___ ___ to dive under the water like whales do.
- The largest animal in the world is a blue ___ ___ _A_ ___ ___.
- A group of whales is called a ___ ___ _D_.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Words may be forwards, backwards, up or down (there are no diagonal words in this puzzle.) When you find a word, either circle it or put a line through it.

```
T A M D B K S C D O L P H I N
B L O W H O L E S R E C H E S
H V O E P T O T P O P S O R S
E E O H O B H A Y W H A L E S
W Y R S D C E W H O U Y L P E
I B A L E E N E O M B B A C I
L B D I Y I W L P A P D R F T
D H I L S T I A P V L E E L I
W C O B C S E N I R A M B U S
H T R U H A L H N E N H B K O
B O W R I D I N G Y K S U E L
A A E P O L D W H B T I L S L
L B R E A C H I N G O L B I A
E W L O B T A I L I N G S T C
```
The Wild Whale Watch Word Search ANSWER KEY

Solve the clues below to figure out what words are hidden in the word search puzzle. Then find the words in the puzzle! Words may be forwards, backwards, up or down (no diagonal words in this puzzle.)

- A humpback whale is a _B_A_L_E_E_N_ whale—it feeds on plankton and does not have teeth.
- Whales breathe through one or two _B_LOWHOLE_L on the top of their heads.
- _B_UBLER helps keep a whale warm in cold water.
- Dolphins may ride in the water that is churned up by the front of a boat. This behavior is called _B_OW-_R_IDING_.
- _B_REACHING is the name used to describe the behavior when whales leap head-first out of the water. They usually make quite a splash!
- Right whales have thickened patches of skin that look white on their heads. Scientists can identify individual right whales by looking at the pattern of their _C_ALIAS_.
- Bottlenose _D_O_LP_HINE_ are toothed whales that are often seen performing in marine parks.
- A whale’s tail is made up of a pair of _F_Lukes_.
- _L_OR_TING is the name given to the behavior where whales slap their tails on the surface of the water.
- _P_LANTATION is a mixture of tiny plants and animals; it is eaten by baleen whales.
- People in different submarines can talk to each other using a _R_A_D_.
- Whales sometimes stick their heads up out of the water and look around. We call this behavior _S_PYTHON (2 words)._.
- Students in _The Wild Whale Watch_ used a _S_UMB_O_M_A_R_I_N_E to dive under the water like whales do.
- The largest animal in the world is a blue _W_H_A_L_E_.
- A group of whales is called a _P_O_D_.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Answer Key:

```
T A M D B K S C  D O L P H I N
B L O W H O L E S  R E C H E S
H V O E P T O T P O P S O R S
E E O H O B H A Y W H A L E S
W Y R S D C E W H O U Y L P E
I B A L E E N E O M B B A C I
L B D I Y I W L P A P D R F T
D H I L S T I A P V L E E L I
W C O B C S E N I R A M B U S
H T R U H A L H N E N H B K O
B O W R I D I N G Y K S U E L
A A E P O L D W H B T I L S L
L B R E A C H I N G O L B I A
E W L O B T A I L I N G S T C
```
My Reading Journal—*The Wild Whale Watch*

Name ________________________________

Here are a few things that you will need to know before completing this project. You may:

- Use pen or pencil
- Use print or cursive writing
- Print from the computer and attach your responses

We suggest that you **read through the entire packet** including the rubrics before you read your book in order to become familiar with the questions.
During Reading

While you are reading your book, take time to answer the following questions on the next three pages. You may use additional paper if needed.

1. **At the end of the first chapter**, stop and make a prediction. What do you think will happen next? Use details from the story to explain your prediction. Use additional paper if needed.

2. As you are reading, write down words that are important to the book you are reading on sticky notes. When you have finished the book, choose three of the words and write them in the boxes below. Look up the definition of these words in a dictionary and copy the definition here. Explain why the words are important to your book. **You may either use words in the book to help with your explanation or you can use your own thoughts.**

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
<th>Why is it important to the book?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Describe the setting of the book. Make sure you include information about when (time period) and where (location) the book took place.

Choose a scene from the book that shows the main setting. (If there is more than one, choose your favorite.) Make a labeled illustration of the setting below. Identify all the characters and landmarks that are important in the book. You may use the back of this page if needed.
After Reading

After you have finished reading the book, complete one of the following essays:

1. Write a journal entry from the point of view of one of the main characters describing an important event in the story. Use details from the story to support your response.

2. Write a letter to a friend. Persuade him or her to read your book. Make sure you include the title, the author and several good reasons to read the book.

3. People often like books because they connect to them. Write a personal response addressing how you connected with the character(s) and/or events in the novel. Remember the various forms of connection:
   - Text to Self (you compared the main character to yourself)
   - Text to Text (this book reminded you of another book you read)
   - Text to World (this book made you think of something that you learned/heard about)

4. Write another chapter or a continuation of the book.

Pre-writing

Use the space below to organize your ideas for writing. You might want to use a web, an outline, or another graphic organizer to help you get started.
SCORING RUBRICS

DURING READING RESPONSES
At the end of the first chapter, stop and make a prediction. What do you think will happen next? Use details from the story to explain your prediction.

<table>
<thead>
<tr>
<th>Score Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The response is an appropriate and logical prediction supported by sufficient and relevant details from the text.</td>
</tr>
<tr>
<td>3</td>
<td>The response is an adequate prediction supported by some details from the text.</td>
</tr>
<tr>
<td>2</td>
<td>The response is a limited prediction supported by few, if any, relevant details from the text.</td>
</tr>
<tr>
<td>1</td>
<td>The response is an attempted prediction.</td>
</tr>
<tr>
<td>0</td>
<td>The response is totally irrelevant.</td>
</tr>
</tbody>
</table>

List three words that are important to the book you are reading. Explain why the words important to your book.

<table>
<thead>
<tr>
<th>Score Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The response is a complete list and accurate explanation of words or phrases supported by sufficient and relevant details from the text.</td>
</tr>
<tr>
<td>3</td>
<td>The response is an incomplete list but accurate explanation of words supported by details from the text. OR The response is a complete list with adequate explanation of words.</td>
</tr>
<tr>
<td>2</td>
<td>The response is a limited list with incomplete explanations. OR The response is a complete list with no explanations.</td>
</tr>
<tr>
<td>1</td>
<td>The response is an attempted list and explanation.</td>
</tr>
<tr>
<td>0</td>
<td>The response is totally irrelevant.</td>
</tr>
</tbody>
</table>

Describe the setting of the book. Make sure you include information about when (time period) and where (place).

<table>
<thead>
<tr>
<th>Score Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>The response is a complete and thorough description of the book's main setting.</td>
</tr>
<tr>
<td>1</td>
<td>The response is an adequate description of the book's main setting.</td>
</tr>
<tr>
<td>0</td>
<td>The response is totally irrelevant.</td>
</tr>
</tbody>
</table>

AFTER READING RESPONSES
Write a journal entry from the point of view of one of the main characters describing an important event in the story. Use details from the story to support your response. OR

Write a letter to a friend. Persuade him or her to read your book. Make sure you include the title, the author and several good reasons to read the book. OR

People often like books because they connect to them. Write a personal response addressing how you connected with the character(s) and/or events in the novel.

<table>
<thead>
<tr>
<th>Score Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score Point</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>4</td>
<td>The response shows a thorough understanding of the text and the question. Specific and relevant details support the answer.</td>
</tr>
<tr>
<td>3</td>
<td>The response shows an adequate understanding of the text and the question. Some specific details are provided to support the answer.</td>
</tr>
<tr>
<td>2</td>
<td>The response shows some understanding of the text or question. Details are either sparse or irrelevant.</td>
</tr>
<tr>
<td>1</td>
<td>Very little understanding of the text is revealed OR the question was answered incorrectly. The answer is sketchy. Key details are missing.</td>
</tr>
<tr>
<td>0</td>
<td>There is no connection between the question and the response.</td>
</tr>
</tbody>
</table>

OR

Write another chapter or a continuation of the book.

<table>
<thead>
<tr>
<th>Score Point</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The response shows that you understood the text and the author's tone. The chapter contains all of the story elements and is a logical, believable continuation of the text.</td>
</tr>
<tr>
<td>3</td>
<td>The response shows that you understood the text. The new chapter contains some of the story elements and is almost believable as a continuation of the text.</td>
</tr>
<tr>
<td>2</td>
<td>The response shows that you understood some of the text. The new chapter is missing elements that would make it believable as a continuation of the text.</td>
</tr>
<tr>
<td>1</td>
<td>The response shows very little understanding of the text. The new chapter is hard to follow and is not cohesive with the rest of the book.</td>
</tr>
<tr>
<td>0</td>
<td>The response is totally irrelevant or incorrect.</td>
</tr>
</tbody>
</table>
Hope you worked hard and enjoyed reading *The Wild Whale Watch*.

Here is what you earned:

- **During Reading (Total Possible = 10)**    _____
- **After Reading (Total Possible = 8)**    _____

**TOTAL**    _____

Teacher’s Comments:
References: This reading journal was modified from “My Summer Reading Journal: A Summer Reading Program of the Appoquinimink School District Incoming 4th & 5th Graders” accessed from: http://www.sleschool.org/ourpages/auto/2008/6/19/1213897707521/LM_Full_4-5_Packet.pdf
Lesson 2: Cetaceans – What makes a whale a whale?

Objectives:
Students will learn about general whale (and dolphin) biology. They will learn to identify cetacean species that they have some familiarity with...such as bottlenose dolphins and killer whales. They will learn the differences between toothed whales (odontocetes) and baleen whales (mysticetes). Finally, they will be introduced to basic external anatomy of cetaceans using right whales, humpback whales and bottlenose dolphins as examples.

What you will need:
- Copies of vocabulary list—one per student (page 2-5 through 2-7)
- Copies of vocabulary worksheet—one per student (page 2-8)
- Ability to project PowerPoint presentation
- Copy of PowerPoint presentation “What makes a whale a whale?”
- (Optional) Whales—Activities based on research from the Center for Coastal Studies (Scholastic Publishers; ISBN 0-590-49156-3)

Standards: CCSS.ELA-Literacy.RI.4.4

Strategy:
1. Explain to the students that during this lesson, they will learn about whale and dolphin biology.
2. Give students a copy of the vocabulary list and explain that these words will be used throughout the lesson. To help students with pronunciation, it would be helpful to read the words to the students and have them repeat them back to you.
3. Present the PowerPoint using the script below.

Slide 1. What makes a whale a whale? Today we will learn about a group of animals called “cetaceans” [suh-TAY-shuns]—these are the whales and dolphins.
Slide 2. Horses, dogs, raccoons and humans are all mammals just like whales and dolphins. There are six main characteristics of a mammal. Who can remember one of the characteristics of mammals that makes them different from other groups of animals? [Students should know characteristics of a mammal from 3rd grade!]
Slide 3. Mammals are all warm blooded; most mammals keep their bodies warm with hair or fat. Many marine mammals have a thick layer of fat or blubber to protect them from the cool ocean waters.
Slide 4. Mammals have backbones made up of individual bones called vertebrae.
Slide 5. Mammals breathe air. Whales and dolphins breathe air through blow holes on the tops of their head, just like cows breathe through their nose.
Slide 6. Mammals have hair. Whales and dolphins have small areas of hair when they are born. For example, baby dolphins have a line of hair similar to a thin mustache that falls off shortly after birth. Whales, such as right whales, may have sparse hairs on the tip of the chin and upper jaw.
Slide 7. Mammals give live birth to their young. If you look really hard, you may be able to see lines on this baby dolphin (called a calf) where it was curled up inside its mother.
Slide 8. Mammals feed their young milk.
Slide 9. Marine mammals are those mammals that are well adapted for life in the ocean. Some marine mammals, like dolphins and whales, spend their entire life in the water. Others, like polar bears, may spend part of their life on land but depend on the ocean for food.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Slide 10. There are several groups of marine mammals. The group we will be learning more about are the cetaceans: the whales, dolphins and porpoises. Seals, sea lions and walruses are in a different group, called the pinnipeds. Manatees and their relatives are in the group called sirenians. Sea otters and polar bears are also considered marine mammals. [Top row: sea lions (pinnipeds), manatees (sirenians), and sea otter; Bottom row: humpback whale (cetacean), beluga whale (cetacean) and walrus (pinniped)]

Slide 11. Cetaceans are divided into two groups: toothed whales and baleen whales. Toothed whales, or odontocetes, like the bottlenose dolphin, have teeth. [Point out the photo of the dolphin:] If you look carefully, you can see the dolphin’s teeth in this picture. Dolphins have up to 100 cone-shaped white teeth along their upper and lower jaws. Baleen whales, also called mysticetes, do not have teeth in their mouths. Instead, they have special fibrous plates called baleen that hang down from the upper jaw. We will talk more about baleen in a few minutes. [Point out the photo on the right side of the slide.] This is a photo of a right whale, which is a type of baleen whale.

Slide 12. Many of the whales that you may be familiar with, and all of the dolphins, are odontocetes. These cetaceans use their teeth to grab prey like fish, squid and even other marine mammals. [Point at top left photo.] Bottlenose dolphins are toothed whales. [Point at top right photo.] Orcas, also known as killer whales are a type of dolphin as well. [Point at bottom photo.] Sperm whales are very deep diving animals, hunting in 3,000 or more feet of water for their favorite food, the giant squid.

Slide 13. The sperm whale is the largest member of the odontocete family. Male sperm whales can reach lengths near 60 ft. That’s almost as long as two school buses! Mature male sperm whales are called “bulls”. Sperm whales are able to hold their breath for more than an hour which allows them to pursue the giant squid deep in the open ocean.

Slide 14. In contrast to the sperm whale, some odontocetes are very small. The Hector’s dolphin, shown in this photo, only gets to be about five feet long. [Suggestion--compare that to your height, or possibly the height of students in the class.]

Slide 15. This slide shows some of the body parts of a dolphin. The “beak” of the dolphin (and other whales) is called the “rostrum.” The forehead is called the “melon.” The blowhole, located on the top of the head, is basically the dolphin's nose. The fin on the dolphin’s back is called the “dorsal fin,” the side fins are called “flippers” and the tail fin is called the “fluke.”

Slide 16. Echolocation is the ability of producing sound waves, and then feeling the vibration as the waves bounce off prey and other items. Odontocetes use echolocation to find food and to navigate. Odontocetes rely on echolocation when they cannot see. For example, sometimes the water they swim in is not clear, or they may be swimming in very deep water where there is little light. To echolocate, odontocetes produce sound waves from the melon and receive echoes which they can feel through the lower jaw. Another characteristic of toothed whales is that they have a single blowhole, whereas baleen whales have paired blowholes.

Slide 17. Dolphins and porpoises are both groups of toothed whales, but they are different from each other. Dolphins tend to have a longer, elongated rostrum and cone-shaped teeth, while porpoises have smaller rostrums, a rounded head, and flat teeth. If you look carefully at the two photographs, you may notice that the dolphin has a taller, hooked or curved dorsal fin), while the porpoise has a triangular dorsal fin. Dolphins tend to live in warmer waters and porpoises often live in colder areas. Dolphins are more talkative than porpoises. Dolphins make whistling sounds through their blowholes to communicate with one another underwater. Scientists are pretty sure that porpoises do not do this.
Slide 18. There are only about 14 species of baleen whales or mysticetes. [Top left photo] Gray whales are only found in the Pacific Ocean; so we will not see them in Florida waters. Mother gray whales go into warm lagoons on Mexico’s Pacific coast to have their calves. Then they migrate north to Alaskan waters to feed in the summer. These whales can be seen migrating along the California coast in late winter and early spring. [Top right photo] Humpback whales are sometimes seen off Florida's coast, but these whales can also be found almost worldwide. [Bottom photo] North Atlantic right whales can sometimes be seen of the northeast coast of Florida in the winter months.

Slide 19. Mysticetes are very large whales, and include the blue whale...the largest creature ever to live on our planet. Blue whales can grow up to 100ft, larger than the largest dinosaur. Blue whales are larger than the largest dinosaur. The heart of a blue whale is the size of a small car. Blue whales were almost hunted to extinction in the early 1900s because whale oil was used for fuel. Today the population is slowly increasing in size.

Slide 20. This is a humpback whale, which is a mysticete. Notice this whale has a small dorsal fin. Humpback whales have long flippers and a large tail fluke. They also have throat pleats, which allow them to stretch their throat open really wide when feeding. Like all mysticetes, the humpback whale has two blowholes.

Slide 21. This is a North Atlantic right whale. Unlike the humpback whale, right whales do not have a dorsal fin. Right whales have short flippers. They also have two blowholes located on the top of their heads.

Slide 22. In some ways, baleen whales are very different from toothed whales. Instead of teeth, they have large baleen plates in their mouth that hang down from their upper jaw. These baleen plates are made of the same material as our fingernails. [Top right photo] In this photograph of a right whale skeleton, you can see the dark baleen. The sheets of baleen are frayed on the inside—these hair-like strands are used to trap the tiniest of sea creatures—like zooplankton and small fish—which are then swallowed in very large numbers. [Top left photo] In this photo two right whales are feeding at the surface.

Slide 23. Baleen whales do not have echolocation. Scientists are still unsure how baleen whales find the dense patches of food they are known to feed on.

Slide 24. Baleen whales have two blowholes rather than the one found on toothed whale species. [Left photo] The blowhole area of a mysticete shows two distinct openings, similar to our nostrils. [Right photo] When the whale exhales, water droplets can make its breath visible and this is called the "blow".

Slide 25. Let's review what we have learned today. What are the two different groups of cetaceans? [toothed (odontocetes) and baleen, (mysticetes)]. How are these two groups similar? [they are whales/mammals; they have flippers, fluke and dorsal fin, etc.] How are they different? [teeth vs baleen; one blowhole vs two; echolocation or not; eat different types of food]

4. Give students the vocabulary worksheet and ask them to complete the puzzles using words from the vocabulary list.

5. Activity entitled “What is a Whale”
   b. Make a double-sided copy of pages 9 and 10, one per student. As noted in the instructions, be careful not to invert the copy on the reverse side as the activity will not work.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
c. Follow instructions for this activity provided on page 8. Students will fold the paper as directed to create a mini-book.
d. The finished mini-book will reinforce the main points covered in the PowerPoint and give them a little project they can take home and share with their family.

   b. Make double-sided copies of pages 11/12 and 13/14...one of each for each student. Again, be careful not to invert the pages while making the copy on the back side of the handout.
   c. If students hold the whale images (pages 11 and 13) up to the light, they should be able to see a drawing of the skeletal structure within the body of the whale.
   d. Students can color the whales. The anatomical features listed are the same as those shown in the PowerPoint presentation.
   e. On the bottom of page 13 there are two questions asking for similarities and differences between the two groups of whales. This can be used to discuss / review the points made in the PowerPoint presentation.

Acknowledgments: A special thanks to the following organizations for use of images in the accompanying PowerPoint presentation: Florida Sea Grant, NOAA, Florida Fish and Wildlife Conservation Commission, US. Fish and Wildlife Service, Georgia Department of Natural Resources (Permit #15488).
Vocabulary


Baleen (bay-LEEN) – These are long plates found in the mouth of baleen whales (mysticetes) and hang from the upper jaw (these whales do not have teeth). Baleen plates are made of material similar to fingernails, which is fringed on the edge. The whale gulps water, then pushes the water out of its mouth through the baleen with its tongue. Then it can swallow all the little sea organisms that were caught in the baleen.

Blowhole – The nose of a whale. A whale's nose, or blowhole, is located on top of its head so it can breathe without having to lift its whole head out of the water. Toothed whales (odontocetes) have one blowhole, but baleen whales (mysticetes) have two.

Cetacean (seh-TAY-shun) – The scientific word for animals in the groups that we call whales and dolphins.

Dorsal Fin – A triangle-shaped fin located on the back of some types of whales and dolphins. The dorsal fin may help stabilize the body of the whale (or dolphin) during swimming and diving, and may help it to regulate body temperature.

Echolocation (eh-koh-loh-KAY-shun) – The production of high frequency sound waves by toothed whales and dolphins (odontocetes). The sound waves bounce off objects and come back to the animal so it is able to “see” through “sound”. The dolphin receives the sound waves as vibrations through the fat and bone in its lower jaw. This system is very much like sonar used by submarines.
Flipper – These are the “arms” of dolphins and whales. They have the same bones in the flippers as you have in your arm and hands. The flippers help the animal steer, turn, and control its position in the water column.

Fluke – The tail of a dolphin or whale. There are no bones in the tail. The backbone ends where the tail fluke starts.

Krill – Very small shrimp-like animals that are important food for baleen whales (mysticetes). The krill get caught on the baleen plates when the whale pushes water out of its mouth with its tongue, then it is able to swallow the krill for its meal.

Mammal – Warm-blooded animals with backbones (vertebrates) that have hair. Mammals also give birth to live young, and produce milk to feed their babies. Mammals breathe air so even though whales live in the ocean they are not like fish at all. They must breathe air and stay warm to survive.

Marine Mammal – This is a group of mammals that can be quite different from each other, but they all live in the ocean for at least part of their life, and depend on the ocean for food. Marine mammals include dolphins and whales, seals and sea lions, manatees, walrus, polar bears and sea otters.

Melon – The forehead of a toothed whale or dolphin. The melon is made up of fatty tissue and often appears to bulge from the forehead area. It is important for sound production as part of the echolocation system.

Mysticete (miss-tuh-SEET)– This is the scientific term for whales that have baleen. These are the largest whales, and the blue whale is the largest animal that has ever lived (larger than the largest dinosaur!!). Mysticetes have two blowholes but do not have an echolocation system. They have baleen plates but no teeth. They feed on very little organisms like krill and plankton.

Odontocete (oh-don-toh-SEET) – This is the scientific term for toothed whales, which includes all of the dolphins. There are more kinds of
odontocetes than mysticetes. These animals have one blowhole, use
echolocation to find fish and other food items, and use teeth to catch and hold
their prey until they can swallow it.

Plankton – Plants and animals that drift on ocean currents. Plankton are often
very small. These are important food items for mysticetes.

Prey – An organism that is eaten by another animal for food.

Rostrum—In some whales and dolphins, the snout that is somewhat like a
dog’s mouth/snout in shape.

Zooplankton (ZOH-plank-ton) – Plankton made up of animals, including
things like larval fish.
Vocabulary Worksheet

Matching:
Draw a line from the word to the best definition for that word.

**Echolocation**
A group of animals that includes dolphins.

**Flipper**
Very small shrimp-like animals.

**Baleen**
The part of a whale that is like your arm.

**Odontocetes**
Large structures found in the mouth of mysticetes.

**Krill**
A type of navigation used by odontocetes.

Fill in the Blank:

The nose of a whale or dolphin is called a ___ O __ O __.

Fish are important ___ R __ ___ for many types of dolphins.

Whales are not fish. They are classified as ___ MM ___ S.

The scientific word for the group of animals that includes whales and dolphins is ___ T A ___ ___ N S.

The triangular structure on the back of a dolphin is a ___ D ___ S ___ F __ N.
Answer Key for Vocabulary worksheet

Matching:
*Draw a line from the word to the best definition for that word.*

- **Echolocation**
  - A group of animals that includes dolphins.

- **Flipper**
  - Very small shrimp-like animals.

- **Baleen**
  - The part of a whale that is like your arm.

- **Odontocetes**
  - Large structures found in the mouth of mysticetes.

- **Krill**
  - A type of navigation used by odontocetes.

Fill in the Blank:

- The nose of a whale or dolphin is called a **B.L.O.W.H.O.L.E**.

- Fish are important **P.R.E.Y** for many types of dolphins.

- Whales are not fish. They are classified as **M.A.M.A.L.S**.

- The scientific word for the group of animals that includes whales and dolphins is **C.E.T.A.C.E.A.N.S**.

- The triangular structure on the back of a dolphin is a **D.O.R.S.A.L**.

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
Lesson 3: Researching Individual Whale and Dolphin Species

Objective: Students will play a modified game of Bingo to learn information about individual cetacean species.

You will need:

- Copies of cetacean fact sheets (one copy of each fact sheet)
- Bingo sheets (pages 3-3 to 3-32; one per student) and bingo markers (you could use small foam pieces or paper cutouts—anything that the students can use to cover the squares on their bingo sheets; if bingo sheets are laminated, dry erase markers or washable markers could be used. A sheet of “bingo chips” is provided on page 3-33; this can be copied and given to students to cut out and use to cover the squares on their bingo sheets)
- Bingo call sheet (page 3-34 to 3-35 and/or page 3-36 to 3-37)
- Optional: PowerPoint bingo presentation (there are two versions, corresponding to call sheets 1 and 2) and ability to project this.

Standards: CCSS.ELA-Literacy.RI4.1

Strategy:

1. Give each student one of the cetacean fact sheets. If there are fewer than 16 students or groups, some students/groups should be given two fact sheets so all fact sheets are distributed. If there are more than 16 students, you can either group the students or make additional copies of fact sheets.
2. Give each individual one of the bingo sheets (and one of the bingo chip sheets, page 3-33, if desired. If bingo chip sheets are used, give students time to cut out the individual squares before starting the game.)
3. Explain that the class will be playing a game of bingo, but with a twist. Instead of the caller (the teacher) simply calling out the name of a whale or dolphin, sometimes they will be calling out a clue. The students will need to read their fact sheets to see if the clue matches the whale or dolphin on their fact sheet. If it does, they need to raise their hand and tell the class the name of their whale or dolphin. At that time, anyone who has that animal on their bingo cards can cover it.
4. The bingo cards have some cetaceans listed for which there are no fact sheets. The teacher will simply call the name of those animals, rather than a clue.
5. Explain that the first objective is to get five whales lined up in a row. Once someone has 5 in a row (horizontally, vertically or diagonally), they should call out “Bingo.” You will then continue the game until someone has their entire card covered (all 16 spaces.) Alternately, you can play until each person has achieved a Bingo.
6. Use the clues until someone calls out “Bingo.” It may be best to use the provided PowerPoint presentation(s) in addition to the list—the presentations allow the students to see the information that is being read and also to see a picture of the cetacean. Once someone calls “Bingo,” check that the whales that they have covered to make their row have actually been

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
called as answers to clues. Remind everyone not to uncover their cards yet, and continue with the clues until someone has achieved the next bingo pattern.

7. Note that there are 30 unique bingo cards for this activity, and two unique “call lists” in case the class wishes to repeat the game (or if the teacher wants to offer to repeat it as a reward for the class later in the school year!)

An alternate activity can be found at: [http://education.ed.pacificu.edu/sweb/bayley/webquest.html](http://education.ed.pacificu.edu/sweb/bayley/webquest.html). Note: This activity requires students to research a cetacean species, using suggested web resources, and develop a PowerPoint presentation. Some of those web resources may give conflicting information, and the reading level, although suggested for 4th grade, may be too high for some 4th grade students. A grading rubric is provided.
## CETACEAN BINGO

<table>
<thead>
<tr>
<th></th>
<th>Common dolphin</th>
<th>Pygmy sperm whale</th>
<th>Orca/killer whale</th>
<th>False killer whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sei whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern right whale</td>
<td>Beluga whale</td>
<td>Minke whale</td>
<td>Bowhead whale</td>
<td>Pacific white-sided dolphin</td>
</tr>
<tr>
<td>dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
<td>Blue whale</td>
<td>FREE</td>
<td>Humpback whale</td>
<td>Bryde’s whale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinner dolphin</td>
<td>North Atlantic right whale</td>
<td>Bottlenose dolphin</td>
<td>Gray whale</td>
<td>Sperm whale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuvier’s beaked whale</td>
<td>Harbor porpoise</td>
<td>Fin whale</td>
<td>Chinese river dolphin</td>
<td>Risso’s dolphin</td>
</tr>
</tbody>
</table>
### CETACEAN BINGO

<table>
<thead>
<tr>
<th>Narwhal</th>
<th>Spinner dolphin</th>
<th>Orca/killer whale</th>
<th>Northern bottlenose whale</th>
<th>Sei whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottlenose dolphin</td>
<td>Risso’s dolphin</td>
<td>North Atlantic right whale</td>
<td>Vaquita</td>
<td>Pygmy sperm whale</td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td>Fin whale</td>
<td>FREE</td>
<td>Sperm whale</td>
<td>Minke whale</td>
</tr>
<tr>
<td>Beluga whale</td>
<td>Humpback whale</td>
<td>False killer whale</td>
<td>Bryde’s whale</td>
<td>Common dolphin</td>
</tr>
<tr>
<td>Gray whale</td>
<td>Short-finned pilot whale</td>
<td>Bowhead whale</td>
<td>Chinese river dolphin</td>
<td>Northern right whale dolphin</td>
</tr>
</tbody>
</table>
**CETACEAN BINGO**

<table>
<thead>
<tr>
<th>Northern right whale dolphin</th>
<th>Sperm whale</th>
<th>Bowhead whale</th>
<th>Pacific white-sided dolphin</th>
<th>North Atlantic right whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pygmy sperm whale</td>
<td>Minke whale</td>
<td>Narwhal</td>
<td>Beluga whale</td>
<td>Common dolphin</td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
<td>Orca/killer whale</td>
<td>FREE</td>
<td>Chinese river dolphin</td>
<td>Bryde’s whale</td>
</tr>
<tr>
<td>Atlantic spotted dolphin</td>
<td>Vaquita</td>
<td>Risso’s dolphin</td>
<td>Sei whale</td>
<td>Fin whale</td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td>Rough toothed dolphin</td>
<td>False killer whale</td>
<td>Spinner dolphin</td>
<td>Short-finned pilot whale</td>
</tr>
<tr>
<td>CETACEAN BINGO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowhead whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orca/killer whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>False killer whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harbor porpoise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sei whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese river dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern bottlenose whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific white-sided dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FREE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sperm whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rough-toothed dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fin whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Atlantic right whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern right whale dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narwhal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaquita</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinner dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pygmy sperm whale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlantic spotted dolphin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CETACEAN BINGO

<table>
<thead>
<tr>
<th>Rough toothed dolphin</th>
<th>Gray whale</th>
<th>Short-finned pilot whale</th>
<th>Blue whale</th>
<th>Orca/killer whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>False killer whale</td>
<td>Spinner dolphin</td>
<td>Sperm whale</td>
<td>Cuvier’s beaked whale</td>
<td>Atlantic spotted dolphin</td>
</tr>
<tr>
<td>Chinese river dolphin</td>
<td>Narwhal</td>
<td>FREE</td>
<td>Harbor porpoise</td>
<td>Fin whale</td>
</tr>
<tr>
<td>Common dolphin</td>
<td>North Atlantic right whale</td>
<td>Bottlenose dolphin</td>
<td>Beluga whale</td>
<td>Pygmy sperm whale</td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td>Risso’s dolphin</td>
<td>Humpback whale</td>
<td>Minke whale</td>
<td>Pacific white-sided dolphin</td>
</tr>
</tbody>
</table>

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
### CETACEAN BINGO

<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
<th>Fin whale</th>
<th>False killer whale</th>
<th>Pygmy sperm whale</th>
<th>Orca/killer whale</th>
<th>Atlantic spotted dolphin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sei whale</strong></td>
<td>Blue whale</td>
<td>Rough toothed dolphin</td>
<td>Northern bottlenose whale</td>
<td>Common dolphin</td>
<td></td>
</tr>
<tr>
<td><strong>Bottlenose dolphin</strong></td>
<td>Beluga whale</td>
<td>FREE</td>
<td>Northern right whale dolphin</td>
<td>Pacific white-sided dolphin</td>
<td></td>
</tr>
<tr>
<td><strong>Risso’s dolphin</strong></td>
<td>Dwarf sperm whale</td>
<td>Vaquita</td>
<td>North Atlantic right whale</td>
<td>Minke whale</td>
<td></td>
</tr>
<tr>
<td><strong>Sperm whale</strong></td>
<td>Narwhal</td>
<td>Gray whale</td>
<td>Cuvier’s beaked whale</td>
<td>Humpback whale</td>
<td></td>
</tr>
</tbody>
</table>

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
### CETACEAN BINGO

<table>
<thead>
<tr>
<th></th>
<th>Bryde’s whale</th>
<th>Bottlenose dolphin</th>
<th>Blue whale</th>
<th>Pacific white-sided dolphin</th>
<th>Dwarf sperm whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narwhal</td>
<td>Pygmy sperm whale</td>
<td>Cuvier’s beaked whale</td>
<td>Orca/killer whale</td>
<td>Rough toothed dolphin</td>
<td></td>
</tr>
<tr>
<td>Bowhead whale</td>
<td>Northern right whale dolphin</td>
<td>FREE</td>
<td>Sei whale</td>
<td>Vaquita</td>
<td></td>
</tr>
<tr>
<td>Chinese river dolphin</td>
<td>Common dolphin</td>
<td>Short-finned pilot whale</td>
<td>Fin whale</td>
<td>Spinner dolphin</td>
<td></td>
</tr>
<tr>
<td>Gray whale</td>
<td>Beluga whale</td>
<td>Minke whale</td>
<td>Northern bottlenose whale</td>
<td>Harbor porpoise</td>
<td></td>
</tr>
</tbody>
</table>

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
### CETACEAN BINGO

<table>
<thead>
<tr>
<th>Humpback whale</th>
<th>Sperm whale</th>
<th>Sei whale</th>
<th>Risso’s dolphin</th>
<th>Spinner dolphin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beluga whale</td>
<td>Fin whale</td>
<td>Pacific whitesided dolphin</td>
<td>Vaquita</td>
<td>Common dolphin</td>
</tr>
<tr>
<td>Blue whale</td>
<td>North Atlantic right whale</td>
<td>FREE</td>
<td>Rough toothed dolphin</td>
<td>Bottlenose dolphin</td>
</tr>
<tr>
<td>False killer whale</td>
<td>Bowhead whale</td>
<td>Chinese river dolphin</td>
<td>Cuvier’s beaked whale</td>
<td>Minke whale</td>
</tr>
<tr>
<td>Pygmy sperm whale</td>
<td>Gray whale</td>
<td>Short-finned pilot whale</td>
<td>Orca/killer whale</td>
<td>Dwarf sperm whale</td>
</tr>
<tr>
<td>CETACEAN BINGO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaquita</td>
<td>False killer whale</td>
<td>Spinner dolphin</td>
<td>Orca/killer whale</td>
<td>Blue whale</td>
</tr>
<tr>
<td>Rough toothed dolphin</td>
<td>Pygmy sperm whale</td>
<td>Sei whale</td>
<td>Risso’s dolphin</td>
<td>Cuvier’s beaked whale</td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
<td>Humpback whale</td>
<td>FREE</td>
<td>Northern bottlenose whale</td>
<td>Dwarf sperm whale</td>
</tr>
<tr>
<td>Bryde’s whale</td>
<td>North Atlantic Right whale</td>
<td>Pacific white-sided dolphin</td>
<td>Chinese river dolphin</td>
<td>Fin whale</td>
</tr>
<tr>
<td>Common dolphin</td>
<td>Atlantic spotted dolphin</td>
<td>Beluga whale</td>
<td>Gray whale</td>
<td>Minke whale</td>
</tr>
<tr>
<td>CETACEAN BINGO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sei whale</strong></td>
<td><strong>Chinese river dolphin</strong></td>
<td><strong>Short-finned pilot whale</strong></td>
<td><strong>Spinner dolphin</strong></td>
<td><strong>Bowhead whale</strong></td>
</tr>
<tr>
<td><strong>Beluga whale</strong></td>
<td><strong>Risso’s dolphin</strong></td>
<td><strong>Fin whale</strong></td>
<td><strong>Common dolphin</strong></td>
<td><strong>Northern bottlenose whale</strong></td>
</tr>
<tr>
<td><strong>Pacific white-sided dolphin</strong></td>
<td><strong>Bryde’s whale</strong></td>
<td><strong>FREE</strong></td>
<td><strong>Cuvier’s beaked whale</strong></td>
<td><strong>Vaquita</strong></td>
</tr>
<tr>
<td><strong>Pygmy sperm whale</strong></td>
<td><strong>North Atlantic Right whale</strong></td>
<td><strong>Rough toothed dolphin</strong></td>
<td><strong>Sperm whale</strong></td>
<td><strong>Atlantic spotted dolphin</strong></td>
</tr>
<tr>
<td><strong>Humpback whale</strong></td>
<td><strong>False killer whale</strong></td>
<td><strong>Northern right whale dolphin</strong></td>
<td><strong>Narwhal</strong></td>
<td><strong>Gray whale</strong></td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atlantic spotted dolphin</strong></td>
</tr>
<tr>
<td><strong>Minke whale</strong></td>
</tr>
<tr>
<td><strong>Dwarf sperm whale</strong></td>
</tr>
<tr>
<td><strong>Rough toothed dolphin</strong></td>
</tr>
<tr>
<td><strong>Northern bottlenose whale</strong></td>
</tr>
<tr>
<td>Rough toothed dolphin</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Pacific white-sided dolphin</td>
</tr>
<tr>
<td>Humpback whale</td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
</tr>
<tr>
<td>Chinese river dolphin</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>CARD #13</th>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vaquita</strong></td>
<td><strong>Beluga whale</strong></td>
</tr>
<tr>
<td><strong>Harbor porpoise</strong></td>
<td><strong>Cuvier’s beaked whale</strong></td>
</tr>
<tr>
<td><strong>Short-finned pilot whale</strong></td>
<td><strong>Bottlenose dolphin</strong></td>
</tr>
<tr>
<td><strong>Humpback whale</strong></td>
<td><strong>Minke whale</strong></td>
</tr>
<tr>
<td><strong>Bryde’s whale</strong></td>
<td><strong>Common dolphin</strong></td>
</tr>
<tr>
<td>CETACEAN BINGO</td>
<td>Gray whale</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Minke whale</td>
<td>Fin whale</td>
</tr>
<tr>
<td>Bryde’s whale</td>
<td>Bowhead whale</td>
</tr>
<tr>
<td>Blue whale</td>
<td>Pacific white-sided dolphin</td>
</tr>
<tr>
<td>Rough toothed dolphin</td>
<td>Chinese river dolphin</td>
</tr>
</tbody>
</table>
## CETACEAN BINGO

<table>
<thead>
<tr>
<th>CETACEAN CLASS</th>
<th>SPECIES</th>
<th>CETACEAN CLASS</th>
<th>SPECIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risso’s dolphin</td>
<td>Spinner dolphin</td>
<td>Gray whale</td>
<td>Bryde’s whale</td>
</tr>
<tr>
<td>Fin whale</td>
<td>Northern bottlenose whale</td>
<td>Vaquita</td>
<td>Common dolphin</td>
</tr>
<tr>
<td>Pacific white-sided dolphin</td>
<td>Northern right whale dolphin</td>
<td>FREE</td>
<td>Short-finned pilot whale</td>
</tr>
<tr>
<td>Bowhead whale</td>
<td>Sperm whale</td>
<td>Blue whale</td>
<td>Bottlenose dolphin</td>
</tr>
<tr>
<td>Sei whale</td>
<td>Dwarf sperm whale</td>
<td>Pygmy sperm whale</td>
<td>Cuvier’s beaked whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
### CETACEAN BINGO

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinner dolphin</td>
<td>Sperm whale</td>
<td>Harbor porpoise</td>
<td>Sei whale</td>
<td>Vaquita</td>
</tr>
<tr>
<td>North Atlantic</td>
<td>Pacific</td>
<td>Northern</td>
<td>Atlantic</td>
<td>Fin whale</td>
</tr>
<tr>
<td>Right whale</td>
<td>white-sided</td>
<td>bottlenose</td>
<td>spotted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dolphin</td>
<td>whale</td>
<td>dolphin</td>
<td></td>
</tr>
<tr>
<td>Risso’s dolphin</td>
<td>Chinese</td>
<td>FREE</td>
<td>Minke whale</td>
<td>Cuvier’s</td>
</tr>
<tr>
<td></td>
<td>river dolphin</td>
<td></td>
<td></td>
<td>beaked whale</td>
</tr>
<tr>
<td>Humpback whale</td>
<td>Narwhal</td>
<td>Bottlenose</td>
<td>False killer</td>
<td>Blue whale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dolphin</td>
<td>whale</td>
<td></td>
</tr>
<tr>
<td>Gray whale</td>
<td>Orca/killer</td>
<td>Short-finned</td>
<td>Beluga</td>
<td>Northern</td>
</tr>
<tr>
<td></td>
<td>whale</td>
<td>pilot whale</td>
<td>whale</td>
<td>right whale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dolphin</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
**CARD #17**

<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic spotted dolphin</td>
</tr>
<tr>
<td>Northern bottlenose whale</td>
</tr>
<tr>
<td>Common dolphin</td>
</tr>
<tr>
<td>Rough toothed dolphin</td>
</tr>
<tr>
<td>Fin whale</td>
</tr>
</tbody>
</table>
### CETACEAN BINGO

<table>
<thead>
<tr>
<th>Minke whale</th>
<th>Sei whale</th>
<th>Bottlenose dolphin</th>
<th>Harbor porpoise</th>
<th>Fin whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narwhal</td>
<td>Cuvier’s beaked whale</td>
<td>Chinese river dolphin</td>
<td>Pacific white-sided dolphin</td>
<td>False killer whale</td>
</tr>
<tr>
<td>Orca/killer whale</td>
<td>Bryde’s whale</td>
<td>FREE</td>
<td>Risso’s dolphin</td>
<td>Short-finned pilot whale</td>
</tr>
<tr>
<td>Sperm whale</td>
<td>Bowhead whale</td>
<td>Rough toothed dolphin</td>
<td>North Atlantic Right whale</td>
<td>Pygmy sperm whale</td>
</tr>
<tr>
<td>Gray whale</td>
<td>Blue whale</td>
<td>Spinner dolphin</td>
<td>Vaquita</td>
<td>Humpback whale</td>
</tr>
</tbody>
</table>

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
<table>
<thead>
<tr>
<th>CARD #19</th>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risso’s dolphin</strong></td>
<td>Northern right whale dolphin</td>
</tr>
<tr>
<td><strong>Vaquita</strong></td>
<td>North Atlantic right whale</td>
</tr>
<tr>
<td><strong>Blue whale</strong></td>
<td>Harbor porpoise</td>
</tr>
<tr>
<td><strong>Narwhal</strong></td>
<td>Spinner dolphin</td>
</tr>
<tr>
<td><strong>Dwarf sperm whale</strong></td>
<td>Humpback whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottlenose dolphin</td>
</tr>
<tr>
<td>Risso’s dolphin</td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
</tr>
<tr>
<td>Gray whale</td>
</tr>
<tr>
<td>Sperm whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fin whale</td>
</tr>
<tr>
<td>Northern bottlenose whale</td>
</tr>
<tr>
<td>Cuvier’s beaked whale</td>
</tr>
<tr>
<td>False killer whale</td>
</tr>
<tr>
<td>Spinner dolphin</td>
</tr>
</tbody>
</table>
### CETACEAN BINGO

<table>
<thead>
<tr>
<th></th>
<th>Sperm whale</th>
<th>Cuvier’s beaked whale</th>
<th>Short-finned pilot whale</th>
<th>Common dolphin</th>
<th>Minke whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>False killer whale</td>
<td>Chinese river dolphin</td>
<td>Northern right whale dolphin</td>
<td>Bowhead whale</td>
<td>Beluga whale</td>
<td></td>
</tr>
<tr>
<td>Orca/killer whale</td>
<td>North Atlantic Right whale</td>
<td>FREE</td>
<td>Northern bottlenose whale</td>
<td>Fin whale</td>
<td></td>
</tr>
<tr>
<td>Gray whale</td>
<td>Humpback whale</td>
<td>Pacific white-sided dolphin</td>
<td>Bottlenose dolphin</td>
<td>Dwarf sperm whale</td>
<td></td>
</tr>
<tr>
<td>Blue whale</td>
<td>Harbor porpoise</td>
<td>Pygmy sperm whale</td>
<td>Spinner dolphin</td>
<td>Sei whale</td>
<td></td>
</tr>
</tbody>
</table>

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
<table>
<thead>
<tr>
<th>Bowhead whale</th>
<th>Narwhal</th>
<th>Orca/killer whale</th>
<th>False killer whale</th>
<th>Blue whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-finned pilot whale</td>
<td>Common dolphin</td>
<td>Bottlenose dolphin</td>
<td>Sperm whale</td>
<td>Blue whale</td>
</tr>
<tr>
<td>Humpback whale</td>
<td>Sei whale</td>
<td>FREE</td>
<td>North Atlantic Right whale</td>
<td>Beluga whale</td>
</tr>
<tr>
<td>Northern right whale dolphin</td>
<td>Northern bottlenose whale</td>
<td>Atlantic spotted dolphin</td>
<td>Chinese river dolphin</td>
<td>Fin whale</td>
</tr>
<tr>
<td>Minke whale</td>
<td>Vaquita</td>
<td>Gray whale</td>
<td>Pacific white-sided dolphin</td>
<td>Bryde’s whale</td>
</tr>
<tr>
<td>CARD #24</td>
<td>CETACEAN BINGO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td>Blue whale</td>
<td>Cuvier’s beaked whale</td>
<td>Fin whale</td>
<td>Atlantic spotted dolphin</td>
</tr>
<tr>
<td>False killer whale</td>
<td>Sei whale</td>
<td>Northern bottlenose whale</td>
<td>Common dolphin</td>
<td>Beluga whale</td>
</tr>
<tr>
<td>Spinner dolphin</td>
<td>Gray whale</td>
<td>FREE</td>
<td>Pygmy sperm whale</td>
<td>Harbor porpoise</td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
<td>Bottlenose dolphin</td>
<td>Bowhead whale</td>
<td>Risso’s dolphin</td>
<td>Rough toothed dolphin</td>
</tr>
<tr>
<td>Chinese river dolphin</td>
<td>Humpback whale</td>
<td>Northern right whale dolphin</td>
<td>Minke whale</td>
<td>Bryde’s whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common dolphin</td>
</tr>
<tr>
<td>Gray whale</td>
</tr>
<tr>
<td>Sperm whale</td>
</tr>
<tr>
<td>Minke whale</td>
</tr>
<tr>
<td>False killer whale</td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
</tr>
<tr>
<td>Northern bottlenose whale</td>
</tr>
<tr>
<td>Spinner dolphin</td>
</tr>
<tr>
<td>Chinese river dolphin</td>
</tr>
<tr>
<td>Northern right whale dolphin</td>
</tr>
<tr>
<td>North Atlantic Right whale</td>
</tr>
<tr>
<td>FREE</td>
</tr>
<tr>
<td>Bowhead whale</td>
</tr>
<tr>
<td>Vaquita</td>
</tr>
<tr>
<td>Pacific white-sided dolphin</td>
</tr>
<tr>
<td>Humpback whale</td>
</tr>
<tr>
<td>Beluga whale</td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
</tr>
<tr>
<td>Risso’s dolphin</td>
</tr>
<tr>
<td>Atlantic spotted dolphin</td>
</tr>
<tr>
<td>Bryde’s whale</td>
</tr>
<tr>
<td>Rough toothed dolphin</td>
</tr>
<tr>
<td>Cuvier’s beaked whale</td>
</tr>
<tr>
<td>Fin whale</td>
</tr>
</tbody>
</table>
### CETACEAN BINGO

<table>
<thead>
<tr>
<th>Pygmy sperm whale</th>
<th>Gray whale</th>
<th>Minke whale</th>
<th>Bryde’s whale</th>
<th>Sei whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic spotted dolphin</td>
<td>Rough toothed dolphin</td>
<td>Bowhead whale</td>
<td>Chinese river dolphin</td>
<td>Beluga whale</td>
</tr>
<tr>
<td>North Atlantic Right whale</td>
<td>Fin whale</td>
<td>FREE</td>
<td>Blue whale</td>
<td>Sperm whale</td>
</tr>
<tr>
<td>Harbor porpoise</td>
<td>Humpback whale</td>
<td>Vaquita</td>
<td>Narwhal</td>
<td>Short-finned pilot whale</td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td>Bottlenose dolphin</td>
<td>False killer whale</td>
<td>Northern right whale dolphin</td>
<td>Spinner dolphin</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
## CETACEAN BINGO

<table>
<thead>
<tr>
<th>Blue whale</th>
<th>Sei whale</th>
<th>Fin whale</th>
<th>Dwarf sperm whale</th>
<th>Narwhal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern bottlenose dolphin</td>
<td>Northern right whale dolphin</td>
<td>Bowhead whale</td>
<td>Rough toothed dolphin</td>
<td>Spinner dolphin</td>
</tr>
<tr>
<td>North Atlantic right whale</td>
<td>Beluga whale</td>
<td>FREE</td>
<td>Minke whale</td>
<td>Harbor porpoise</td>
</tr>
<tr>
<td>Common dolphin</td>
<td>Cuvier’s beaked whale</td>
<td>Pygmy sperm whale</td>
<td>Atlantic spotted dolphin</td>
<td>Bryde’s whale</td>
</tr>
<tr>
<td>Humpback whale</td>
<td>Chinese river dolphin</td>
<td>Short-finned pilot whale</td>
<td>Risso’s dolphin</td>
<td>Orca/killer whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>CETACEAN BINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risso’s dolphin</strong></td>
</tr>
<tr>
<td><strong>Rough toothed dolphin</strong></td>
</tr>
<tr>
<td><strong>Cuvier’s beaked whale</strong></td>
</tr>
<tr>
<td><strong>Short-finned pilot whale</strong></td>
</tr>
<tr>
<td><strong>Vaquita</strong></td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
## CETACEAN BINGO

<table>
<thead>
<tr>
<th>Orca/killer whale</th>
<th>Pygmy sperm whale</th>
<th>Sperm whale</th>
<th>Northern right whale dolphin</th>
<th>Humpback whale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern bottlenose whale</td>
<td>Fin whale</td>
<td>Risso’s dolphin</td>
<td>Minke whale</td>
<td>False killer whale</td>
</tr>
<tr>
<td>Harbor porpoise</td>
<td>Spinner dolphin</td>
<td>FREE</td>
<td>Pacific white-sided dolphin</td>
<td>Common dolphin</td>
</tr>
<tr>
<td>Gray whale</td>
<td>Spinner dolphin</td>
<td>Cuvier’s beaked whale</td>
<td>Atlantic spotted dolphin</td>
<td>Vaquita</td>
</tr>
<tr>
<td>Chinese river dolphin</td>
<td>Short-finned pilot whale</td>
<td>Beluga whale</td>
<td>Rough toothed dolphin</td>
<td>Dwarf sperm whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
CARD #30

## CETACEAN BINGO

<table>
<thead>
<tr>
<th>Harbor porpoise</th>
<th>Sei whale</th>
<th>Cuvier’s beaked whale</th>
<th>Fin whale</th>
<th>Rough toothed dolphin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese river dolphin</td>
<td>Short-finned pilot whale</td>
<td>Atlantic spotted dolphin</td>
<td>Dwarf sperm whale</td>
<td>False killer whale</td>
</tr>
<tr>
<td>Bowhead whale</td>
<td>Gray whale</td>
<td>FREE</td>
<td>Common dolphin</td>
<td>Sperm whale</td>
</tr>
<tr>
<td>Risso’s dolphin</td>
<td>Beluga whale</td>
<td>Spinner dolphin</td>
<td>Bottlenose dolphin</td>
<td>Orca/killer whale</td>
</tr>
<tr>
<td>Pacific white-sided dolphin</td>
<td>Northern bottlenose whale</td>
<td>Northern right whale dolphin</td>
<td>Minke whale</td>
<td>Pygmy sperm whale</td>
</tr>
</tbody>
</table>

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
<table>
<thead>
<tr>
<th>BINGO “CHIPS” (cut out and use to cover spaces on your card)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image of whales" /> <img src="image2.png" alt="Image of whales" /> <img src="image3.png" alt="Image of whales" /> <img src="image4.png" alt="Image of whales" /></td>
</tr>
<tr>
<td><img src="image5.png" alt="Image of whales" /> <img src="image6.png" alt="Image of whales" /> <img src="image7.png" alt="Image of whales" /> <img src="image8.png" alt="Image of whales" /></td>
</tr>
<tr>
<td><img src="image9.png" alt="Image of whales" /> <img src="image10.png" alt="Image of whales" /> <img src="image11.png" alt="Image of whales" /> <img src="image12.png" alt="Image of whales" /></td>
</tr>
<tr>
<td><img src="image13.png" alt="Image of whales" /> <img src="image14.png" alt="Image of whales" /> <img src="image15.png" alt="Image of whales" /> <img src="image16.png" alt="Image of whales" /></td>
</tr>
<tr>
<td><img src="image17.png" alt="Image of whales" /> <img src="image18.png" alt="Image of whales" /> <img src="image19.png" alt="Image of whales" /> <img src="image20.png" alt="Image of whales" /></td>
</tr>
</tbody>
</table>

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
CALL LIST FOR CETACEAN BINGO GAME

LIST 1:

1. This whale has one of the longest known migrations of any mammal, traveling about 10,000 miles. [Answer: Gray whale]
2. Dwarf sperm whale
3. This whale comes to warm Florida waters to have its babies (calves) every winter. It can sometimes be seen from the beaches of north Florida. [Answer: North Atlantic right whale]
4. This small mysticete only grows to about 30 feet long, but it is found in all oceans. It is not currently endangered but is protected by in U.S waters by the Marine Mammal Protection Act. . [Answer: Minke (MIN-key) whale]
5. Individual whales of this species can be identified by the white markings on their flippers, and the underside of their tail fluke. [Answer: Humpback whale]
6. Northern bottlenose whale
7. Harbor porpoise
8. Vaquita (vah-KEY-tah)
9. Northern right whale dolphin
10. This unusual odontocete hunts squid and octopus. It has grooves in its throat to help suck in prey. [Answer: Cuvier’s (COO-vee-yays) beaked whale]
11. This endangered mysticete was hunted until about 1965, when up to 30,000 animals were killed by whalers each year. These whales are now fully protected, except for a small amount of tribal hunting in Greenland. [Answer: Fin whale]
12. These small odontocetes have a long slender snout and easily recognized because they will jump out of the water and spin their entire body around several times before re-entering the water. [Answer: Spinner dolphin]
13. Atlantic spotted dolphin
14. This whale is the biggest animal that has ever lived; bigger than the largest dinosaur. [Answer: Blue whale]
15. This whale is born dark gray but becomes snowy white as it matures, therefore it is often called “the white whale.” [Answer: Beluga (buh-LOO-guh) whale]
16. This whale has a bracket-shaped marking behind its eye, which looks like the gill of a fish. [Answer: Pygmy sperm whale]
17. This dolphin is commonly seen throughout the coastal waters of Florida; it is important to remember that feeding this dolphin can be harmful to the animal and is illegal. [Answer: Bottlenose dolphin]
18. Bowhead whale
19. Pacific white-sided dolphin

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
CETACEAN BINGO CALL LIST 1 (cont.)

20. This rare dolphin may be extinct. A live animal of this species has not been seen since 2002. [Answer: Chinese river dolphin]

21. Risso’s (RIH-z-ohs) dolphin

22. Males of this species grow a single elongated tusk that may be many feet long. This structure is thought to be the basis of the mythical unicorn horn. [Answer: Narwhal (NAR-wull)]

23. This large odontocete is easily recognized by its large, bulbous, melon head. Its body color is black or dark brown, and it has a large gray “saddle” behind the dorsal fin. [Answer: Short-finned pilot whale]

24. This whale is the largest of the odontocetes. [Answer: Sperm whale]

25. Common dolphin

26. Bryde’s (BROO-duss) whale

27. This whale was given its name because it has been known to kill other whales and even great white sharks. [Answer: Orca/killer whale]

28. Rough toothed dolphin

29. False killer whale

30. Sei (SAY or SIGH) whale
CALL LIST FOR CETACEAN BINGO GAME

LIST 2:

1. These dolphins are commonly found in zoos and aquaria. One female has lived in an aquarium at Marineland, Florida for more than 58 years. [Answer: Bottlenose dolphin]

2. Northern right whale dolphin

3. Sei (SAY or SIGH) whale

4. These whales can be recognized by the big white growths ("callosities") on their heads. Unique patterns of callosities are used to identify individual animals. [Answer: North Atlantic right whale]

5. Atlantic spotted dolphin

6. Males of this whale have two small teeth that stick out of the lower jaw, which they use for fighting. [Answer: Cuvier’s (COO-vee-yays) beaked whale]

7. This whale is famous for its songs. Males repeatedly sing songs of 10-20 min each for hours on end. Individual whales can be identified by their unique songs. [Answer: Humpback whale]

8. Bryde’s (BROO-duss) whale

9. Calves of this whale species can gain weight at a rate of 10 lbs per hour. [Answer: Blue whale]

10. Rough toothed dolphin

11. This whale’s tongue is half yellow or white and half mottled black. [Answer: Fin whale]

12. These mysticetes are fast swimmers; they can swim up to 21 miles per hour! [Answer: Minke (MIN-key) whale]

13. Northern bottlenose whale

14. Common dolphin

15. These whales have white barnacles on their head, and may also have orange crab-like animals, called cyamids, on their bodies. [Answer: Gray whale]

16. Risso’s (RIH-z-ohs) dolphin

17. Vaquita (vah-KEY-tah)

18. This whale is the same type as the famous “Moby Dick”. Adult males have been documented occasionally striking boats for unknown reasons, causing very severe damage. [Answer: Sperm whale]

19. False killer whale

20. Pacific white-sided dolphin

21. Historically, this dolphin inhabited the Yangtze River in China. Sadly, it is now believed to be extinct. [Answer: Chinese river dolphin]

22. This whale is severely threatened by climate change. As more Arctic ice melts, ship traffic in its home range is increasing, creating a greater risk of being hit by ships. [Answer: Narwhal (NAR-wull)]

23. Harbor porpoise

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
CETACEAN BINGO CALL LIST 2 (cont.)

24. Bowhead whale

25. This small toothed whale usually travels in large groups of 20-90 animals. These whales are involved in "mass stranding" events along the Florida coastline every few years. Some of these stranding events may involve more than 100 animals coming onshore at the same time. [Answer: Short-finned pilot whale]

26. A few of these whales are kept in captivity, and some of these have lived in Florida for more than 40 years. [Orca/killer whale; Bottlenose dolphin could be another correct answer, but you have already called a clue for bottlenose dolphins]

27. Dwarf sperm whale

28. This is the only whale that has a flexible neck and the ability to move its head up and down, and side to side. Scientists believe this ability helps them to hunt for prey on the bottom in shallow areas. [Answer: Beluga (buh-LOO-guh) whale]

29. When startled or frightened, this whale can release large amounts of reddish brown liquid, or "ink", to confuse predators. [Answer: Pygmy sperm whale]

30. These dolphins travel in very large groups, sometimes up to several thousand animals. They can be seen jumping out of the water and spinning over and over again. [Answer: Spinner dolphin]
Image sources:


Cetacean Fact Sheets

These fact sheets were developed for use with lessons in the cetacean 4th grade curriculum, using the most current data available at the time (2013). However, as research continues on these animals, the data in these fact sheets may become outdated. It is recommended that teachers check the NOAA Fisheries Office of Protected Resources website (http://www.nmfs.noaa.gov/pr/) for the most current information. Additional information was obtained from fact sheets on the American Cetacean Society website (www.acsonline.org), and the following scientific journal articles:


*Beluga age estimates are obtained by counting growth lines in their teeth. Research published in 2006 (Stewart et al. Can. J. Zool 84: 1840-1852) showed that previous estimates of 2 growth lines per year were incorrect, and belugas actually have one growth line per year. So, many sources quote the lifespan of belugas as 30-50 years, but those estimates are based on the assumption of two growth lines per year. The 2006 paper estimates a lifespan of 77-79 years for belugas.

Photo/Image sources:

Whale illustrations by Garth Mix were provided by NOAA Fisheries. Thanks to Jonathan Shannon (NOAA Fisheries) for providing several photographs for these fact sheets.

http://upload.wikimedia.org/wikipedia/commons/4/4b/Beluga_size.svg

Blue whale:
http://upload.wikimedia.org/wikipedia/commons/d/d3/Blue_Whale_001_noaa_body_color.jpg;

Humpback whale:
http://www.nmfs.noaa.gov/pr/images/cetaceans/humpbackwhale_noaa_large.jpg


This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Beluga Whale
(Pronounced: buh-LOO-guh)

**Common name:** Beluga whale

**Scientific name:** *Delphinapterus leucas*

**Type of whale:** Toothed (odontocete)

**Maximum Length:** 16 feet (5 meters)

**Maximum Weight:** 3300 lbs (1500 kg)

**How long can they live?** Up to 79 years*

**Where do they live?** Belugas live in the cold, polar arctic and subarctic areas near Alaska, Canada and Russia. They can be seen swimming near icebergs when water temperatures are near freezing. Beluga whales are unusual. They can move from the ocean into rivers. Most marine cetaceans cannot survive for very long in fresh water. Belugas prefer very shallow coastal waters to the deep open ocean.

**Special Characteristics:** Belugas are also called white whales. Calves are very dark gray in color when born. The gray color fades over time so that they are snow white when mature. Belugas do not have a dorsal (back) fin.

**What type of prey do they eat?** Many types of fish, but they also eat shellfish (clams and mussels), shrimp, squid, octopus and even crabs.

*This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)*
What type of predator might eat them? Killer whales and polar bears both will eat belugas. Belugas can be trapped by ice, making it easier for a polar bear to get them. Belugas that are trapped by ice can sometimes suffocate.

What are the human threats? Humans have hunted beluga whales for their thick skin, which has been used for leather. Shipping, oil and gas production and transport, commercial fishing gear, pollution, habitat destruction and noise are all threats to belugas.

Are they endangered? Although global estimates of beluga whales are greater than 60,000 animals, there is one sub-population that is considered highly endangered. The belugas of Cook Inlet have had their population reduced and only about 280 animals are believed to remain there. All cetaceans are protected under the Marine Mammal Protection Act.

Fun Facts: Belugas are the only whale or dolphin that can move their necks. The neck vertebrae of most whales are fused (joined together), but this is not the case for belugas. Scientists think this ability to move the neck may help them hunt for prey in very shallow water. Belugas are also called “canaries of the sea” because of the sounds they make. Unlike other whales and dolphins, you can see the melon move when they are singing. As much as 4/10 (40%) of a Beluga whale’s weight is blubber!
**Blue Whale**

**Common name:** Blue whale

**Scientific name:** *Balaenoptera musculus*

**Type of whale:** Baleen (mysticete)

**Maximum Length:** A blue whale 108 feet (33 meters) long was reported in waters near Antarctica. Whales in the North Atlantic and North Pacific oceans reach about 88 feet (27 meters) in length.

**Maximum Weight:** 330,000 lbs (150,000 kg)

**How long can they live?** At least 40 years, but possibly up to 90 years.

**Where do they live?** Blue whales can be found anywhere in the ocean, however most sightings occur in colder waters.

**Special Characteristics:** Blue whales have long, slender bodies. They are mottled gray, but appear blue when seen through the water. Their heads look wide and flat when viewed from above.

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
**What type of prey do they eat?** Krill (tiny shrimp-like animals that are about the size of a jelly bean).

**What type of predator might eat them?** Killer whales have been documented attacking a blue whale off the coast of Baja California. Many blue whales in the Pacific seem to have scars that suggest attacks by killer whales. In the North Atlantic, blue whales have also been hurt or have died by accidentally getting themselves entrapped in ice.

**What are the human threats?** Ship strikes and entanglement in commercial fishing gear are the main threats to blue whales. Noise and disturbance by whale-watching boats are also possible threats.

**Are they endangered?** Yes. Blue whales are considered endangered throughout their range. Population estimates range from about 4000 to 6000 animals worldwide.

**Fun Facts:** Blue whale calves may grow 2 inches (5 cm) a day and gain 10 lbs (4.5 kg) of weight in an hour. Blue whales are the largest animals to ever live, bigger than even the biggest dinosaur. Blue whales can hold their breath for up to 50 minutes and can dive to depths of 330 feet (100 meters).
Common name: Humpback whale

Scientific name: *Megaptera novaeangliae*

Type of whale: Baleen (mysticete)

Maximum Length: 48 feet (14.6 meters)

Maximum Weight: 80,000 lbs (36,287 kg)

How long can they live? Scientists estimate humpbacks can live 40-50 years.

Where do they live? Humpback whales can be found in all oceans. Most humpback populations migrate to cold, temperate waters during the summer to feed and then move to warm tropical waters in the winter for breeding and calving.

Special Characteristics: Humpback whales are easily recognized by their very large white flippers.
What type of prey do they eat? Krill (small shrimp-like animals) and very small fish.

What type of predator might eat them? Orcas (killer whales)

What are the human threats? Historically man was the humpback's most important predator. They were heavily hunted by whalers until they were protected in the 1960s and 1970s. Today, entanglement in fishing gear, ship strikes and harassment by whale watching boats are their main threats, although some nations are also proposing to start hunting them again.

Are they endangered? Yes, humpbacks are considered endangered throughout their range.

Fun Facts: Humpback whales are famous for their unique singing behavior. Adult male humpback whales sing songs that last an average of 10-20 minutes. They will repeat the same song over and over for many hours. Different populations of whales can be identified by their unique songs. The purpose of the singing behavior is not understood, but some scientists think it may have to do with mating behavior. Individual humpback whales can be identified by the pattern of white markings on the underside of the tail fluke. Humpback whales can hold their breath for up to 20 minutes and can dive to depths of up to 500 feet (150 meters).
Orca/Killer Whale

**Common name:** Orca or Killer whale

**Scientific name:** *Orcinus orca*

**Type of whale:** Toothed (odontocete)

**Maximum Length:** 30 feet (9 meters)

**Maximum Weight:** 12,000 lbs (5600 kg)

**How long can they live?** Males: up to 60 years; Females: up to 90 years. (There is a killer whale that has lived in the Miami Seaquarium for more than 40 years. She is one of the oldest killer whales in captivity.)

**Where do they live?** Killer whales are found in all oceans but prefer colder waters. They are usually found in northern temperate waters, within 500 miles (800 km) of shore.

**Special Characteristics: What type of prey do they eat?** Fish (they love salmon), or other marine mammals including seals and very large whales.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
What type of predator might eat them? In rare instances great white sharks may be able to take a killer whale, however wildlife filmmakers have recently shown killer whales attacking and killing a large great white shark.

What are the human threats? Main threats include contaminants such as pesticides in the water, human overfishing of the whales’ prey items, ship collisions and oil spills. Other threats may include noise, entanglement in fishing gear and harassment by whale watching boats.

Are they endangered? One small population of killer whales living near Puget Sound, Washington, is considered endangered. All other killer whales, like all cetaceans, are protected under the Marine Mammal Protection Act.

Fun Fact: There are three kinds of killer whales, called “Ecotypes”. These are “Resident”, “Transient” and “Offshore”. The Resident killer whales tend to live in coastal waters and eat fish. These whales love to eat salmon when the fish return to the rivers to spawn. The Transient whales hunt in the open sea and eat other marine mammals. These are the only whales that are capable of hunting in packs and for this reason they have been called “the wolves of the sea”. By hunting as a team they are able to kill and eat whales that are much larger than themselves. The Offshore killer whales are not well understood, but scientists think that these whales are also fish eaters. Killer whales can hold their breath for up to 15 minutes and can dive to depths of 825 feet (250 meters).

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
North Atlantic Right Whale

Common name: North Atlantic right whale

Scientific name: *Eubalaena glacialis*

Type of whale: Baleen (mysticete)

Maximum Length: 55 feet (16.7 meters)

Maximum Weight: 140,000 lbs (63,500 kg)

How long can they live? We have very little data on the lifespan of these whales, but scientists estimate they may live up to 50 years.

Where do they live? The North Atlantic right whale lives along the Atlantic coast of North America. Females and young animals swim to waters off the coasts of Georgia and Florida during the winter. However, it is not clear where the adult males go in the winter. Right whales travel to the Bay of Fundy to feed during the summer months.

Special Characteristics: Right whales develop big white growths on their head called “callosities”. The pattern of callosities is unique to each individual animal and these patterns are used to recognize specific individuals. A catalog

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
of these animals is maintained and almost every North Atlantic right whale is recognizable as an individual by scientists.

**What type of prey do they eat?** Zooplankton (very tiny animals that live in the planktonic soup. Many types of zooplankton are larval fish or very tiny shrimp-like animals).

**What type of predator might eat them?** Sharks will feed on carcasses of North Atlantic right whales. It seems doubtful that they could eat a healthy adult, but calves may be at risk, especially if they are sick or injured.

**What are the human threats?** Ship collisions and entanglement in fishing gear are the major threats to North Atlantic right whales. Noise may also affect these whales.

**Are they endangered?** Yes. These whales are critically endangered. It is estimated that there may be as few as 450 left.

**Fun Fact:** Right whales are called “Right Whales” because they were the “right” whale to hunt. They are slow moving and often found close to shore. When killed the carcass would float rather than sink, making it much easier to harvest them from small boats.
Bottlenose Dolphin

Common name: Bottlenose Dolphin

Scientific name: *Tursiops truncatus*

Type of whale: Toothed (odontocete)

Maximum Length: up to about 9 feet in Florida coastal waters (2.8 meters)

Maximum Weight: In Florida, the maximum weight is about 600 lbs (about 280 kg). Offshore bottlenose dolphins may be much larger and heavier.

How long can they live? The oldest documented wild bottlenose dolphin is 61 years old (in 2011), in Sarasota Bay, Florida. The oldest known captive bottlenose dolphin is 60 years old (in 2013) and lives in Florida at Marineland's Dolphin Adventure.

Where do they live? Bottlenose dolphins are found worldwide in tropical and temperate waters. There are coastal and offshore populations.

Special Characteristics: Bottlenose dolphins always appear to be smiling, simply because their anatomy creates that impression. They have no control over this expression.

What type of prey do they eat? Fish

What type of predator might eat them? Sharks

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
**What are the human threats?** Accidental injury and death because of entanglement in recreational and commercial fishing gear, exposure to pollutants and toxins, direct harvest (in Japan and Taiwan).

**Are they endangered?** No. However, all cetaceans are protected under the Marine Mammal Protection Act.

**Fun Facts:** These are the dolphins most commonly seen performing at zoos and aquariums. Many parks allow visitors to swim with bottlenose dolphins. They have also been the stars of many TV shows and movies, including “Flipper” and “Dolphin Tale”. Baby dolphins have a few hairs on their rostrum that they lose shortly after birth. Bottlenose dolphins can hold their breath for up to 8 minutes and can dive to depths of 1250 feet (390 meters). Bottlenose dolphins use a feeding strategy called “fish whacking” where they strike a fish with their tail flukes and knock it out of the water before eating it.

*Acknowledgment: The authors thank Dr. Randy Wells, Sarasota Dolphin Project, for review and comment.*

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
Common name: Sperm Whale

Scientific name: *Physeter macrocephalus*

Type of whale: Toothed (odontocete)

Maximum Length: Male sperm whales can grow to 52 feet (16 meters), making them the largest toothed whale. Females, while also very large, are much smaller with a maximum length of about 36 ft (11 meters).

Maximum Weight: A large male sperm whale can weigh 90,000 lbs (40,823 kg); a large female is much smaller, weighing in at only 30,000 lbs (13,607 kg).

How long can they live? Up to 70 years.

Where do they live? Sperm whales can be found in all oceanic waters worldwide. They are deep water animals and are rarely found close to shore or in water less than about 984 ft (300 m) deep. They are occasionally found in deep waters around some oceanic islands, including Hawai‘i. Females and young whales tend to stay in warmer waters (tropical and subtropical) but adult males may be found near pack ice in both the northern and southern hemispheres.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Special Characteristics: Sperm whales are special because they have a single blowhole, but it is located on the left side of their head rather than in the center. Their blow is easily recognized as left of center.

What type of prey do they eat? Giant squid, also sharks, skates and fish.

What type of predator might eat them? Adult sperm whales are probably not preyed on by other animals. Young or sick animals may be at risk of attack by sharks. There is a documented case of a sperm whale being hunted and killed by killer whales off the coast of California.

What are the human threats? Sperm whales are hunted by humans in some parts of the world. Ship strikes and entanglement in fishing gear are possible threats. Noise may also impact sperm whales.

Are they endangered? Yes, sperm whales are still considered “endangered,” but the species seems to be recovering.

Fun Facts: The famous book *Moby Dick* was about a white sperm whale. Adult male sperm whales occasionally attack ships for unknown reasons and can cause catastrophic damage. The sperm whale is an extremely deep diving whale, diving down more than 7,400 ft (2,250 meters). These whales can hold their breath for up to two hours!
Narwhal
(Pronounced: NAR-wull)

Common name: Narwhal

Scientific name: Monodon monoceros

Type of whale: Toothed (odontocete)

Maximum Length: Males: 15 feet (4.6 meters); Females: 13 feet (4 meters)

Maximum Weight: Males: 3500 lbs (1600 kg); Females: 2000 lbs (900 kg)

How long can they live? 115 years

Where do they live? (geographic range): Arctic Ocean

Special Characteristics: Male narwhals have an elongated tusk, which is actually a tooth that grows through the front of the jaw. Adult narwhals typically have a spotted pattern. Narwhals have no dorsal fin, which may make it easier for them to swim underneath ice.

What type of prey do they eat? Arctic cod (fish), flatfish, squid and oceanic shrimp.

What type of predator might eat them? Orcas (killer whales), walruses, polar bears.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
**What are the human threats?** The main threat to narwhals is climate change, which most scientists agree is being accelerated by human actions. As ice in the Arctic is reduced, more ships are entering Arctic waters, so narwhals are at an increased risk of being hit by ships. Exploration for oil drilling is another threat to narwhals.

**Are they endangered?** No. However, all cetaceans are protected under the Marine Mammal Protection Act.

**Fun Facts:** The narwhal’s long, spiral tusk may be the source of the myth of the unicorn. Narwhals have a thick layer of blubber. Narwhals migrate offshore in the fall, perhaps so they will not become trapped by near-shore ice in the winter. Male narwhals probably use their tusks to fight with other males over a female whale. The narwhal can hold its breath for up to 20 minutes and may be able to dive to a depth of 3,300 feet (1,000 meters).
Pygmy Sperm Whale

Common name: Pygmy sperm whale

Scientific name: *Kogia breviceps*

Type of whale: Toothed (odontocete)

Maximum Length: 11.5 feet (3.5 meters)

Maximum Weight: 1000 lbs (450 kg)

How long can they live? Not known

Where do they live? (geographic range): In temperate and tropical seas worldwide (Atlantic, Indian and Pacific Oceans)

Special Characteristics: Pygmy sperm whales have a bracket-shaped marking behind the eye, which looks like a fish’s gill. Pygmy sperm whales have no teeth in their upper jaws.

What type of prey do they eat? Squid, octopus, crabs, shrimp and fish.

What type of predator might eat them? Unknown, but sharks will prey on stranding animals

What are the human threats? Pygmy sperm whales are occasionally caught accidentally in commercial fishing nets. They are occasionally struck by ships.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Some stranded pygmy sperm whales have had plastics and other garbage blocking their guts. Human noise may interfere with sperm whale behavior.

**Are they endangered?** No, although they commonly strand along the southeastern US coast.

**Fun Facts:** When pygmy sperm whales feel threatened, they can eject reddish-brown liquid (referred to as “ink”) into the water to help them escape from predators. Pygmy sperm whales can probably dive to at least 1000 feet (300 m) in search of food.
Cuvier’s beaked whale
(Pronounced: COO-vee-yays)

Common name: Cuvier’s beaked whale
Scientific name: Ziphius cavirostris
Type of whale: Toothed (odontocete)
Maximum Length: 23 feet (7 meters)
Maximum Weight: 6,800 lbs (3,100 kg)
How long can they live? Estimates are from 25 to 60 years
Where do they live? (geographic range): Cuvier’s beaked whales are found in most oceans and seas worldwide, except the polar regions.
Special Characteristics: The jawline is slightly upturned, giving the whale a “smiling” appearance. The lower jaw sticks out beyond the upper jaw. Males have two small cone-shaped teeth sticking out of the lower jaw—these are often used for fighting. Coloration ranges from dark gray to reddish brown. The bodies are often covered with scratches and scars.
What type of prey do they eat? Mostly squid and octopus, sometimes fish and crustaceans
What type of predator might eat them? Unknown, but sharks will prey on stranding animals
What are the human threats? Entanglement in fishing gear, ship strikes and possible trauma from acoustic sources (noise). Cuvier’s beaked whales are
sometimes caught by Japanese whaling operations that are hunting other beaked whales.

**Are they endangered?** No. However, all cetaceans are protected under the Marine Mammal Protection Act.

**Fun Facts:** Cuvier’s beaked whales use a pair of grooves in their throats to help them suck in their prey. They can dive down to 6,200 feet (1,888 m) and can hold their breath up to 95 minutes. Cuvier’s beaked whales are sometimes called “goosebeak” whales.

![Cuvier's Beaked Whale Range](image-url)
Minke Whale  
(Pronounced: MIN-key)

Common name: Minke whale  
Scientific name: *Balaenoptera acutostrata*  
Type of whale: Baleen (mysticete)  
Maximum Length: 33 feet (10 meters)  
Maximum Weight: 20,000 lbs (9,200 kg)  
How long can they live? Scientists estimate minke whales can live up to 47 years  

Where do they live? (geographic range): Minkes are found in all oceans, although they are rarely observed in the tropics. They seem to prefer icy waters.  

Special Characteristics: Minke whales vary in body size, patterns, coloration and baleen based on geographic location.  

What type of prey do they eat? Small schooling fish (capelin, cod, herring, pollock) or krill (small shimp-like plankton); sometimes copepods (plankton).  

What type of predator might eat them? Orcas (Killer whales)  

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
What are the human threats? Minkes are sometimes hunted by whalers. Minkes may be accidentally trapped in commercial fishing gear. Underwater noise may interfere with the ability of minke whales to communicate.

Are they endangered? No. However, all cetaceans are protected under the Marine Mammal Protection Act.

Fun Facts: Minke whales are also known as the Little Piked Whale. Minkes are fast swimmers, and can reach speeds of 16-21 miles/hour (26-33 km/hr). Minke whales can dive for up to 15 minutes. At sea, minke whales are curious and may approach vessels, especially those that are stationary. Minke whales migrate seasonally.
**Common name:** Fin whale

**Scientific name:** *Balaenoptera physalus*

**Type of whale:** Baleen (mysticete)

**Maximum Length:** 78 feet (24 meters) in the northern hemisphere; 88 feet (27 meters) in the southern hemisphere

**Maximum Weight:** 160,000 lbs (72,500 kg)

**How long can they live?** Scientists estimate they may live up to 100 years

**Where do they live? (geographic range):** Fin whales are found in all oceans of the world, but they seem to prefer temperate and polar waters.

**Special Characteristics:** The fin whale is light gray to brownish-black on its back and sides. These whales may have lighter-colored bands which start behind the blowholes, curve back towards the tail, then turn back towards the eye. The right side of the lower jaw is white or creamy yellow, while the left side is mottled black; this coloring is repeated on the baleen, and is reversed on the tongue.

**What type of prey do they eat?** Small, shrimp-like animals called krill or euphausiids; schooling fish

**What type of predator might eat them?** Orcas (killer whales)

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
What are the human threats? From 1935-1965, as many as 30,000 fin whales were slaughtered each year by whalers. They are now protected from hunting except for a small amount of tribal hunting in Greenland. Other threats include collisions with boats, entanglement in fishing gear, reduced prey abundance because of overfishing, and disturbance from noise.

Are they endangered? Yes

Fun Facts: Fin whales can eat up to 2 tons (4,400 lbs/2,000 kg) of food a day. They can dive up to 1,800 feet (550 meters) deep and can hold their breath for up to 30 minutes. The age of fin whales can be estimated by counting the layers present in waxy ear plugs which form in the ear canal.
Chinese River Dolphin

**Common name:** Chinese River Dolphin

**Scientific name:** *Lipotes vexillifer*

**Type of whale:** Toothed (odontocete)

**Maximum Length:** 8 feet (2.5 meters)

**Maximum Weight:** 500 lbs (220 kg)

**How long can they live?** Maybe as long as 25 years (based on an individual in captivity)

**Where do they live? (geographic range):** Historically, these dolphins were found in the middle to lower reaches of the Yangtze (Yang-see) River. More recently, the habitat range has been greatly reduced because of human development along the river.

**Special Characteristics:** The Chinese river dolphin has very small eyes. It is pale blue to gray on its back.

**What type of prey do they eat?** A variety of freshwater fish species.

**What type of predator might eat them?**

**What are the human threats?** Chinese river dolphins are caught in fishing gear or killed by electro-fishing (a technique that uses electricity to stun fish before they are caught). Other threats include pollution, river development

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
project, collisions with vessels and loss of prey. Underwater explosions used to enlarge river channels have killed some dolphins.

**Are they endangered?** Yes. A survey conducted in 2006 failed to find a single Chinese river dolphin, and concluded that this species may be extinct. The last sighting of a live Chinese river dolphin was in 2002.

**Fun Facts:** This dolphin was regarded as the goddess of protection by Chinese fishermen and boatmen in the Yangtze River region. It is also known as the Yangtze river dolphin, baiji, white-flag dolphin and white-fin dolphin.

![Chinese River Dolphin Range Map](image-url)
Short-finned pilot whale

**Common name:** Short-finned Pilot Whale

**Scientific name:** *Globicephala macrorhynchus*

**Type of whale:** Toothed (odontocete)

**Maximum Length:** 24 feet (7.3 meters)

**Maximum Weight:** 6,600 lbs (3000 kg)

**How long can they live?** Up to 63 years

**Where do they live? (geographic range):** They are typically found in deeper waters throughout tropical and subtropical areas of the world.

**Special Characteristics:** Short-finned pilot whales have a bulbous melon head with no noticeable beak. These whales are black or dark brown with a large gray “saddle” behind the dorsal fin.

**What type of prey do they eat?** Mostly squid, some octopus and fish in deep water (1,000 feet/300 meters or more)
**What type of predator might eat them?** Unknown, but sharks will prey on stranding animals; pilot whales are often involved in mass strandings (up to several hundred whales at a time).

**What are the human threats?** Pilot whales get entangled, hooked and captured by a variety of commercial fishing gear. There are pilot whale fisheries in Japan and the Lesser Antilles. Ships can hit pilot whales.

**Are they endangered?** No. However, all cetaceans are protected by the Marine Mammal Protection Act. These whales are involved in “mass stranding” events along the Florida coastline every few years. Some of these stranding events may involve more than 100 animals coming onshore at the same time.

**Fun Facts:** Short-finned pilot whales are the second largest species in the dolphin family (after the orcas or killer whales). Pilot whales are very social animals and are most often found in groups of 20 to 90 whales. Pilot whales are exhibited in many aquariums and zoos.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Spinner Dolphin

Common name: Spinner dolphin

Scientific name: *Stenella longirostris*

Type of whale: Toothed (odontocete)

Maximum Length: 7 feet (2 meters)

Maximum Weight: 170 lbs (77 kg)

How long can they live? Unknown

Where do they live? (geographic range): Spinner dolphins are found in all tropical and subtropical oceans.

Special Characteristics: Spinner dolphins have long, slender snouts or beaks. They are known for leaping out of the water and spinning (up to four revolutions) as many as 14 times in a row.

What type of prey do they eat? Mid-water fishes and deep-water squid.

What type of predator might eat them? Sharks, orcas (killer whales) and possibly false killer whales, pygmy killer whales and pilot whales.

What are the human threats? Spinner dolphins are often trapped and drowned in yellowfin tuna nets.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Are they endangered? No. The eastern Pacific population of spinner dolphins is considered “depleted” because of impacts from tuna fishing. All cetaceans are protected by the Marine Mammal Protection Act.

**Fun Facts:** Spinner dolphins often occur in groups of several hundred to several thousand animals. They feed mostly at night, while resting during daylight hours.
**Gray whale**

**Common name:** Gray whale

**Scientific name:** *Eschrichtius robustus*

**Type of whale:** Baleen (mysticete)

**Maximum Length:** 50 feet (15 meters)

**Maximum Weight:** 80,000 lbs (35,000 kg)

**How long can they live?** Up to 80 years

**Where do they live? (geographic range):** Gray whales live in shallow, coastal waters of the North Pacific Ocean.

**Special Characteristics:** Gray whales have a mottled gray body, with small eyes located just above the corner of the mouth. They do not have a dorsal fin, but have a “dorsal hump” about two-thirds of the way back on the body, and a series of small bumps, known as “knuckles” between the dorsal hump and the tail. Gray whales commonly have white barnacles and orange crab-like animals called cyamids on their bodies.

**What type of prey do they eat?** Small shrimp-like amphipods that live in mud on the sea floor.

**What type of predator might eat them?** Orcas (killer whales)

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
What are the human threats? Before the mid 1930’s, gray whales were hunted commercially. Modern-day threats include collisions with boats, entanglement in fishing gear, disturbance from ecotourism and whale watching, and disturbance from noise.

Are they endangered? Only the western Pacific population of gray whales is listed as endangered.

Fun Facts: A gray whale’s tail flukes are more than 15 feet (3 m) wide. Gray whales were once called “devil fish” by whalers. Gray whales make one of the longest annual migrations of any mammal—they travel about 10,000 miles (16,000 km) round trip. Gray whales are frequently seen from shore; some will approach small boats and allow themselves to be touched by humans. A gray whale can hold its breath for about 25 minutes and can dive to depths of about 550 feet (170 meters).
Lesson 4: How big are cetaceans?

Objectives: Students will research and compare the lengths of different cetaceans and will display them using a “whale-o-meter.” They will use multiplication to estimate the weight of killer whale (orca) at different ages. Optional activity: Students will use math to create life-size drawings of different cetaceans.

What you will need:
- Whale-o-meter data sheets (1 per student or group of students)
- Whale-o-meter rope (100 feet, marked in 10 foot increments with flagging tape or colored cable ties; have each mark labeled with the length measurement.)
- Access to a long hallway, sidewalk or playing field (at least 100 feet)
- Cetacean fact sheets (from Lesson 3) or other cetacean reference materials (internet or library)
- Optional: How fast does a killer whale grow? worksheet (page 4-6; 1 per student)
- Optional: Globe or world map showing the names of the oceans
- Graph paper (quarter inch squares, 1 piece per student; one inch squares, approximately 2 sheets per student)
- Butcher paper roll


Strategy:
1. If possible, before class starts, set up the whale-o-meter rope by extending it along the edge of a hallway or sidewalk, or across a playing field.
2. Explain to the students that they are going to create a “whale-o-meter” (rhymes with thermometer). Write this word on the board.
3. Ask students what the word “meter” is used for. Give them hints—what do we use each of these items for? Use the illustration page (4-12) to show students these different types of meters and explain what they are used for:
   a. Thermometer (measuring temperature)
   b. Speedometer (measuring how fast a car is driving)
   c. Pedometer (measuring the number of steps someone takes)
   d. Odometer (in a car) (measuring how far the car has driven)
   e. Barometer (used by weather forecasters) (measuring atmospheric pressure)
   f. Seismometer (measuring how strong an earthquake is)
4. What did all the words have in common? (the word “meter” and they were all ways of MEASURING something)
5. Ask the students what they think a whale-o-meter would be used for (measuring whales!)

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
6. Explain that the students will be researching different types of cetaceans, and will be using the whale-o-meter to show the rest of the class how different cetaceans compare in length.

7. If you have more than 16 students, pair them up so you have no more than 16 pairs.

8. Give each student/pair of students a copy of the whale-o-meter data sheet and a copy of a cetacean fact sheet. Each student/pair of students will get a different whale or dolphin fact sheet.

9. Have the students use the fact sheets to complete the information on the whale-o-meter data sheet. It may be helpful to have a globe or map showing the names of the oceans to help students answer the question about where their cetacean lives.

10. Once students have completed the data sheets, have them take turns sharing the information on the sheet with the rest of the class.

11. Once everyone has shared their information with the class, take the class to the area where the rope has been set up. Explain that the rope is the whale-o-meter, and explain that it is marked in 10-foot increments.

12. Have each student/pair locate the point along the rope that represents the maximum length for their cetacean, and place their data sheet at that point. They will have to estimate the distances by using the 10 foot increments as a guide (you can have them use rulers if you want them to get exact measurements).

13. Have one student (or teaching assistant) stand at the “zero” point of the line. Walk to the first whale-o-meter data sheet. If all 16 fact sheets were used, this first data sheet should be the spinner dolphin, at 7 feet. Pick up the data sheet. Explain to students that the distance between you and the person at the “zero” is the length of a spinner dolphin (7 feet). Replace the data sheet. Move to the next closest fact sheet. Repeat for all of the fact sheets (you should end up with the blue whale, which can get to 108 feet).

14. In the classroom, have students complete the “How fast does a killer whale grow?” worksheet.

15. OPTIONAL ACTIVITY: Creating a life-size drawing of a whale or dolphin. If using butcher paper, this activity is best done in a multi-purpose room or gymnasium with hard floors and lots of room to spread out! If done outside, a basketball court or empty parking lot is ideal.
   a. Divide the class into groups of five to ten. Assign each group one of the cetaceans for which there is a scale drawing (pages 4-8 to 4-9).
   b. Provide each student with one of each of the two types of graph paper (1/4”--page 4-10 and 1”-- page 4-11).
   c. Have students trace around a fairly small object (preferably something with an irregular shape, like their handprint; if you have access to stencils, those might be good for this activity) on the ¼” graph paper. The traced object should fit within the grid given.
   d. Explain to the students that they are going to make an enlarged version of their drawing, by using the 1” grid paper. Have the students number their small squares as shown below. Have them number their large squares the same way.
e. Have the students transfer their drawing from the small squares to the large squares. It is easiest to do this one square at a time. The numbers will help the students keep track of the squares.

f. Now explain to the students that they will be using this same method to create life-size drawings of whales. Distribute one or two sheets of 1” graph paper to each group. Explain that the students will copy the drawing of their whale from the scale drawing onto the 1” graph paper (they can trace the drawing if they would prefer). They should number the squares as they did for the first activity. If possible, make two or three copies of the finished drawing for the students to work from in the next step.

g. If using butcher paper, unroll the butcher paper*. Use a 100’ tape measure to cut the butcher paper into lengths appropriate for the whales to be drawn. The larger whales will need several pieces of butcher paper, as they are from 20-30 feet high (the number of pieces will be determined by the width of the butcher paper). Help the students tape their butcher paper sheets together (masking tape is good for this as students will be able to draw over the masking tape with pencil).

h. Have pairs of students stretch out tape measures along all 4 sides of each sheet of paper. Have another student hold the end of a carpenter’s chalk line at one of the ten foot marks. Stretch the line to the opposite ten foot mark. Have another student put their finger on the chalk line at that opposite side of the paper. Lift up the line slightly and allow it to snap down on the paper. Pick up the line and move it to the next ten foot increment (try not to drag it on the paper). Repeat. You may be able to get 3-4 lines marked before you have to wind the chalk line back into the spool and then start again.

i. Once the lines are marked, the group of students should use pencil to lightly number the squares to match the squares on their scale drawing.

j. The students should then work together to transfer the drawing to the butcher paper. Each student should copy an equal number of squares. Once the outline is finished, the students can use paint or thick markers to trace the complete outline.

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
k. If desired, you could have the students estimate the area of their whale’s outline (each square is 100 square feet).

*Amount of butcher paper needed will be as follows:

- Bottlenose dolphin: 3 feet x 10 feet
- Beluga: 6 feet x 16 feet
- Cuvier’s beaked whale: 6 feet x 23 feet
- Orca: 16 feet x 30 feet
- Humpback: 18 feet x 50 feet
- Right whale: 20 feet x 55 feet
- Fin whale: 18 feet x 80 feet
- Blue whale: 26 feet x 82 feet

References:

- How fast does a killer whale grow? worksheet is adapted from a Sea World activity called “Graphing Growth”
- Whale-o-meter is adapted from Shark Trust’s “Make your own sharkometer”
  www.eggcase.org/do_download.asp?did=26628
- Life-size whale is adapted from Aquatic Project Wild activity “Whale of a Tail”
WHALE-O-METER data sheet

My whale is called a _________________________________

My whale is a (circle one) baleen whale toothed whale

My whale can grow as big as _____ feet long.

My whale lives in the (circle all that apply)
Pacific Ocean Atlantic Ocean Arctic Ocean Indian Ocean

Some interesting things that I learned about my whale: (suggestions: How deep can it dive? How long can it hold its breath? Does it have unusual color patterns or markings? What does it eat? Does it have any other names?)

__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________

Use the back side of this sheet to draw a picture of your whale
How fast does a killer whale grow?

A baby killer whale weighs about 350 pounds at birth. For the first two years of its life, it grows at a rate of about 60 pounds every month. Between year two and three, a killer whale averages about 80 pounds of weight gain per month. Between years three and five, the growth slows with an average weight gain of about 30 pounds a month.

1. Based on the information given above, calculate how much a killer whale should weigh at each age. Show your calculations in the “Weight” boxes and circle your answer:

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Weight (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Example: 350 + (3 x 60) = 350 + 180 = 530</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

2. A 2012 Volkswagen beetle car weighs 2939 pounds. Circle the one that weighs more: is it the 4-year-old killer whale, or the Volkswagen beetle?
**ANSWER KEY**

**How fast does a killer whale grow?**

A baby killer whale weighs about 350 pounds at birth. For the first two years of its life, it grows at a rate of about 60 pounds every month. Between year two and three, a killer whale averages about 80 pounds of weight gain per month. Between years three and five, the growth slows with an average weight gain of about 30 pounds a month.

1. Based on the information given above, calculate how much a killer whale should weigh at each age. Show your calculations in the “Weight” boxes and circle your answer:

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Weight (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Example: 350 + (3 x 60) = 350 + 180 = 530</td>
</tr>
</tbody>
</table>
| 6            | 350 + (6 x 60) = 710  
Alternate solution 530 + (3 x 60) |
| 12           | 350 + (12 x 60) = 1070  
Alternate solutions 710 + (6 x 60)  
Or 530 + (9 x 60) |
| 24           | 350 + (24 x 60) = 1790  
Alternate solutions 1070 + (12 x 60)  
Or 710 + (18 x 60)  
Or 530 + (21 x 60) |
| 36           | 1790 + (12 x 80) = 2750 |
| 48           | 2750 + (12 x 30) = 3110 |
| 60           | 3110 + (12 x 30) = 3470 |

2. A 2012 Volkswagen beetle car weighs 2939 pounds. Circle the one that weighs more: is it the 4-year-old killer whale, or the Volkswagen beetle?

This activity is available online at: [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
Cetacean Sketches for Scale Drawing

Beluga (16 feet)

Blue whale in the Atlantic Ocean (88 feet)

Humpback whale (48 feet)

Killer whale (orca) (30 feet)

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
North Atlantic Right Whale (55 feet)

Bottlenose dolphin (9 feet)

Cuvier’s beaked whale (23 feet)

Fin whale (78 feet)

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Lesson 5: Scientific names—understanding where those funny words come from

Objectives: Students will use Greek and Latin word roots to interpret the scientific names of some whales. Students will create a hypothetical cetacean. They will use the Greek and Latin roots to create a scientific name (genus and species) for their cetacean.

What you will need:

- Copies of Greek and Latin word fragment sheet for each student (page 5-4; for parts 1 and 2)
- White board or overhead projector/Elmo and markers for part 1.
- Either printed copies of the whale images (pages 5-5 to 5-8) to hand out to students, or a single copy of the images to project using an Elmo for part 1.
- Art supplies as desired (pencils, paper, paints, newspaper, glue, clay...) for part 2.
- Copies of Cetacean Information sheet (page 5-9) for all students (for part 2).

Sunshine State Standards: VA.4.S.1.1; VA.4.D.3.1; VA.4.F.1.1

Strategy:

Part 1: Learning about scientific names

1. Explain that every plant and animal has its own scientific name that is recognized by scientists around the world. The scientific name has two parts to it—the first part is called the “genus name” and the second part is the “species name”. Organisms with the same genus name are closely-related, while those with similar species names may share common features, such as shape or color. The species name is usually an adjective that describes something about the organism, the person who discovered the organism, or where the organism was first located. The scientific name is usually made up of words that come from either Latin or Ancient Greek.
2. Distribute copies of the Greek and Latin word fragment sheet.
3. Explain that the scientific name for the North Atlantic right whale is *Eubalaena glacialis*. Write this name on the board. Explain to the students that these words come from one Greek and two Latin words (also referred to as “roots”). Have the students look on the sheet for the words (eu, balaena and glacialis) and ask them what each one means.
   a. Eu = true
   b. Balaena = whale
   c. Glacialis = frozen

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
So, a literal translation of this name would be “frozen true whale” (probably because it can be found in very cold waters.)

4. Explain that the scientific name for the short-finned pilot whale is *Globicephala macrorhynchus*. Write this name on the board. Show the students that these words come from three Greek and one Latin root. Have the students look on the sheet for the words (glob, cephal, macro and rhynch) and ask them what each one means.
   a. Glob = globe, ball
   b. Cephal = head
   c. Macro = large
   d. Rhynch = beak, snout

So, a literal translation of this name would be “large snout ball head.” Show students a picture of a short-finned pilot whale (page 5-5) and show them how the scientific name is a good descriptor for this whale (it has a ball-shaped head, and a large beak or snout).

5. Ask the students to use the list of Greek and Latin word fragments to help decipher the following scientific names. Show them images of the whales:
   a. *Balaena mysticetus* (bowhead whale) [whale mustache whale]
   b. *Balaenoptera musculus* (blue whale) [muscle/muscular winged whale]
   c. *Tursiops truncatus* (bottlenose dolphin) [porpoise appearance provided with a trunk]
   d. *Ziphius cavirostris* (Cuvier’s beaked whale) [hollow daughter of snout sword]

**Part 2: Create an imaginary cetacean!**

1. Distribute the Greek and Latin word fragments and meanings sheet.
2. Explain to students that they are going to create/draw an imaginary cetacean, and that they will be using the word fragments to create a scientific name that describes their whale or dolphin.
3. Encourage the students to create their scientific name first. Remind them that there are two parts to the scientific name, and that each part can contain a single word fragment, or two or more word fragments in combination. The first word (genus) should begin with a capital letter; the second word (species) should begin with a small letter. The scientific name should be printed in italics, or underlined.
4. Once the students have created a scientific name, they should draw or use other artistic media (sculpting, papier maché, painting etc.) to draw a picture/ create a model of their cetacean. They should write the scientific name of their whale (along with the translation of that name) on their picture, or create a label for their model.
5. Distribute “Cetacean information” sheets to students. Explain to students that they are marine biologists who have discovered the cetacean that they named in step 2. Encourage students to be creative when filling out the (imaginary) information on this sheet. Students

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
will use this information as the basis for a newspaper article describing the discovery of their cetacean, and providing information about its life history.

References:
- “Name Game” in Sea World Whales Teacher Guide for grades 4-8
- “Fashion a Phytoplankton” from NOAA's Southeast Phytoplankton Monitoring Network; and Susan Seagraves’ “Fashion a Fish” activity.
Greek and Latin word fragments and meanings

a- — no, lacking, none (Latin)
-aceous — of, or pertaining to (Latin)
-al — having the character of (Latin)
albus — white (Latin)
anglic — English (Latin)
-atus — provided with (Latin)
australis — southern (Latin)
balaena — whale (Latin)
barb — beard (Latin)
boREALIS — northern (Latin)
brevis — short (Latin)
caeruleus — blue (Latin)
cavus — hollow (Latin)
cephal — head (Greek)
cer — horn (Greek)
cet — whale, sea monster (Greek)
crass — thick, heavy (Latin)
delphin — dolphin (Greek)
dent — tooth (Latin)
derm — skin (Latin)
-eella — suffix added to noun stem to indicate “small” (Latin)
eu — true (Greek)
fero — to bear (Latin)
glacialis — frozen (Latin)
glob — globe, ball (Latin)
grav — heavy (Latin)
halo — sea, salt (Latin)
inus — like (Greek)
ic — added to nouns to form adjectives (Latin)
leuc-; leucos — white (Greek)
lineatus — lined or striped (Latin)
lip — fat (Latin)
long — long (Latin)
macro — large (Latin)
maculatus — spotted (Latin)
mauro- — dark or black (Greek)
meg — great (Greek)
mela — black; dark (Latin)

mono- — single (Greek)
musculus — muscle (Latin)
myst — mustache (Greek)
nas — nose (Latin)
nov — new (Latin)
obscurus — dark (Latin)
ocul — eye (Latin)
odon — tooth (Greek)
-oides — like (Greek)
oo- — egg (Latin)
op-; -opsis — appearance (Greek)
orca — great killer (Latin)
orcinus — belonging to the underworld (Latin)
oscu- — mouth (Latin)
pachy- — thick (Greek)
phocaen — porpoise (Latin)
-phore — bearer (Latin)
physeter — blower (Greek)
platy- — flat or broad (Greek)
pseud — false (Greek)
pter — having wings or fins (Latin)
robustus — strong, robust (Latin)
rostra; rostralis — beak, snout (Latin)
rhynch-; rhynchos — beak, snout (Greek)
sten — narrow, straight (Greek)
tachy- — quick; swift (Latin)
tes — having to do with (Greek)
trunc — trunk, stem (Latin)
tursi — porpoise (Latin)
vulgaris — common (Latin)
ziph (from xiph) — sword (Greek)
Short-finned pilot whale
*Globicephala macrorhynchus*
North Atlantic right whale

*Eubalaena glacialis*
Cuvier’s beaked whale
*Ziphius cavirostris*

Bottlenose dolphin
*Tursiops truncatus*
Bowhead whale  
*Balaena mysticetus*


Blue whale  
*Balaenoptera musculus*

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Student name: __________________________

Cetacean Information

What is the scientific name of your cetacean (2 words)?
_______________________________________________________________________________________

What is the English translation of this scientific name?
__________________________________________________________________________________________

Where does your cetacean live? (in what ocean or oceans, near shore, in very deep water, etc.)
__________________________________________________________________________________________

How big is your cetacean?
__________________________________________________________________________________________

Does your cetacean migrate, or live its entire life in one region?
__________________________________________________________________________________________

Does your cetacean have any special color patterns? What are they?
__________________________________________________________________________________________

Is there anything special about your cetacean’s size, body shape, fins, etc? If so, what?
__________________________________________________________________________________________
__________________________________________________________________________________________

What does your cetacean eat?
__________________________________________________________________________________________

Does anything eat your cetacean?
__________________________________________________________________________________________

Use the information above as the basis for a newspaper article. You will write the newspaper article as though you are a marine biologist who has just discovered the cetacean you have described. In the article, you should be creative in describing the animal, its habitat and its life history. If you would like, you can describe the voyage during which you discovered the animal. Your article should contain at least three paragraphs (introductory, body and concluding).

This activity is available online at: http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Lesson 6: Cetacean behaviors

Objectives: Students will learn about behaviors that many whales and dolphins can be seen doing. Students will make whale puppets and use them to model different behaviors. Students will conduct a simulated whale research expedition.

You will need:

- Ability to project PowerPoint presentation
- Copy of PowerPoint presentation “Cetacean Behaviors”
- Optional: Internet connection (as a back-up to show YouTube videos directly from the internet)
- Optional: Speakers for PowerPoint presentation

Sunshine State Standard: SC.4.L.16.3

Vocabulary:

Behavior – an observable activity.

Breaching – The whale leaps out of the water head first. Usually whales and dolphins roll in the air so that they land on their side when they hit the water, creating a lot of noise and a huge splash.

Bow Riding – Dolphins are well known for bow or wake riding. The dolphins will swim in the waves at the bow of a boat or the wake or waves behind a boat. They may continue this behavior for quite a long while.

Disturbance - annoyance or disruption of natural behavior such as migration, breathing, nursing, breeding, feeding, or sheltering. Marine mammals often display certain behaviors in response to disturbance.

Flippering – A whale at the surface rolls onto its side and then hits the surface of the water with its flipper. This is also called a flipper slap.

Lobtailing – The whale dives down but leaves its tail out of the water, then slaps the surface of the water with its fluke.

Logging – A whale resting at the surface can look like a floating log.

Spouting – When a whale comes to the surface to breathe it releases a lot of air, called its “spout”, when it exhales. Following a very long or deep dive, whales may need to remain at the surface for some time (almost an hour in some cases) to catch their breath before they are ready to dive again.

Spyhopping – A whale lifts its upper body out of the water. It is thought that this allows the whale to look around and see what is happening above the surface of the water.

Vessel – Usually refers to a boat, but could refer to a jetski or other form of water transportation.
Strategy: There is an instructional PowerPoint presentation and two (optional) activities that reinforce concepts introduced in the presentation.

Presentation: Whale Behavior (PowerPoint)

Teacher Script

Slide 1. Many of you have probably seen dolphins or other toothed whales performing at places like Marineland or Sea World [or insert your local marine mammal park’s name]. The things that these animals do on command in captivity are usually based on behaviors that the animals do naturally in the wild. Today we are going to learn about some whale and dolphin behaviors.

Slide 2. Why do we care about whale behavior? Because whales and dolphins spend so much time underwater, often in very deep water, it is a challenge for biologists to study them. Although whales make sounds, we cannot tell what those sounds mean. However, when these animals are at the surface, we can make observations about what they are doing, and can try to learn more about them based on their behaviors.

Slide 3. Let’s read these behaviors together [point to each one in turn and have the class read them out loud with you. It may be helpful to explain to the class that “bow” in “bow riding” is pronounced the same way as the verb, “to bow,” with a long “ow” rather than a shorter “oh” sound]. In this lesson, we will learn more about these common dolphin behaviors.

Slide 4. Although whales and dolphins also have many different types of feeding behaviors, those will be covered in a different lesson; however, I want to point out this commonly seen behavior called begging. Begging is a behavior learned by dolphins and other marine mammals that have been fed by humans. Feeding or attempting to feed a dolphin or other marine mammals is illegal. [see lesson 7]

Slide 5. Often dolphin species are seen moving very slowly at the surface of the water in small groups. This behavior is called resting. It is very important to give these dolphins lots of space, because they need to rest in order to have enough energy to feed, mate and nurse their young. Some dolphin species such as spinner dolphins rest during the day.

Slide 6. Groups of dolphins are often seen moving quickly in the same direction. This behavior is called traveling.

Slide 7. Our next behavior is called breaching. Breaching is a very dramatic behavior. During breaching, a dolphin or whale jumps head first out of the water. While in the air they may rotate their body so they land on their side, creating a HUGE splash!! Both baleen and toothed whales use this behavior. Scientists are not sure why whales and dolphins breach. Ideas include communication with other animals, stunning prey so they are easier to catch or showing that they feel threatened by something. [Click on video to start it. Video is about 60 seconds in length. You might want to be ready to mute the audio for this clip—there are people shrieking quite loudly in it!]. Did you recognize the type of whale in this video? [Correct answer is orca or killer whale.]
Slide 8. Let’s start by talking about bow riding. Many different types of dolphins can be seen bow or wake riding. Note that baleen whales do NOT bow ride! Dolphins ride the waves created in front of or behind boats and may do this for minutes to hours. It can look like the boat will run over the dolphins, but scientists think dolphins use this to save energy. It may be that bow riding is similar to what people experience when they go “body surfing” which is “surfing” without a surf board. This is often a fun game for humans to play at the beach. People should never drive a boat towards dolphins in order to try and get them to bow ride. This can be dangerous to the dolphins. Let’s watch some dolphins bow riding in this video clip. [click on the video to play it. If needed, the direct link is also given on the slide, but this will require that you be connected to the internet, and will open the video in a new window. Video clip is about 1.5 minutes.]

Slide 9. When people get too close to dolphins, or the animals feel threatened, they may display certain behaviors. These can include tail slapping or breaching, mothers shielding calves from people or vessels, and animals swimming away quickly. Scientists call these “disturbance behaviors.”

Slide 10. Dolphins are very social animals. However, it’s important to give dolphins lots of space and view them from a distance. It is very difficult to tell the difference between social behaviors and disturbance behaviors.

Slide 11. Some whale behaviors have funny names. Let’s read these behaviors together [point to each one in turn and have the class read them out loud with you.]

Slide 12. Let’s watch some video of whales breaching. Breaching may be a way for whales to scratch their backs. [Click on video to start it; video is 1 minute in length]. Can you tell me anything about this whale? [You might prompt students to see if they can tell if it is a toothed whale or baleen whale…it is a humpback whale, which is a type of baleen whale. Students might be able to identify it because of its long, white flippers]

Slide 13. This next video shows one of the reasons that people should stay far away from whales. Getting too close could be dangerous for people and for the whale. This clip is a news report showing a young right whale that breached and landed on a sailboat. [Click on video to start it. Video is about 50 seconds in length. You might mention that people need to stay at least 100 yards away from most whales. This is the length of a football field. People need to stay 500 yards away from right whales.]

Slide 14. Our next behavior is called flippering or flipper slapping. Baleen whales do this by rolling on their side and hitting one flipper on the surface of the water. Scientists do not know why whales do this behavior. [Click on video to start it. Video is about 25 seconds in length].

Slide 15. When lobtailing, a whale positions its body so that its head is down and the tail flukes are above the surface of the water. The whale repeatedly hits the surface of the water with the big flukes. The sound can be very loud and may be heard for some distance. Scientists do not know why whales display this behavior. Captive groups of dolphins that are upset or annoyed display a similar behavior called tail slapping. [Click on video to start it. Video is about 4 minutes in length, but the first 20 seconds or so is probably enough to give the students the idea! To stop the video, click on it again].
If you have visited Marineland, Sea World or other marine parks, you may have seen whales or dolphins trained to “wave goodbye” by standing on their head and waving their tail flukes at the crowd. This is an example of how trainers are able to modify a behavior that whales and dolphins do on their own, and train the animals to perform the natural movement for entertainment purposes.

Slide 16. Logging is very different from the active behaviors seen so far. The term is used to describe a behavior in which whales stay very still at the water’s surface, moving mainly to take a breath. This behavior may be part of resting after a deep dive. It is possible that whales may sleep in this position. [Click on video to start it. Video is about 30 seconds in length.] You can see that the whales could be very hard to see when they are in this position. Logging whales are at risk of being hit by boats or ships.

Slide 17. Spouting is the term given to the spray of fine water droplets that forms when a whale exhales, or breathes out. In colder weather, the breath is more visible, for the same reason that you can see your own breath on cold mornings. The breath is made of warm air and water droplets. The spout of different types of whales looks quite different. Experienced observers can identify a species of whale from the appearance of the spout on the horizon. [Click on video to start it. Video is about 18 seconds in length. Note that the right whale should have a V-shaped spout. Unfortunately in this video clip it is hard to make that out. The whale is turned toward the camera at an angle that makes this very hard to see. Plus it is up and down quickly, making it that much more difficult to interpret.]

Slide 18. Here we have a blue whale spouting. [Click on video to start it. Video is about 90 seconds in length. Note that the blue whale spout does not appear to rise as high in the air as the humpback whale spout. The character of the spout is thicker at the bottom. The whale filmed here is traveling, making the character of the spout more difficult to describe.] Some of these videos were clearer than others, just like some days are clearer than others out on the ocean. Imagine if you were a whale biologist and you were trying to identify the type of whale you were seeing based only on their spouting. That might be a bit of a challenge! Remember that some whales can hold their breath for a very long time, so you might easily have to wait ten minutes to see a single whale breathe twice, assuming it doesn’t swim too far away for you to see it during that time!

Slide 19. When “spy hopping” a whale pops its head up out of the water and looks around. To do this, the whale positions itself in the water column head up and tail down. It lifts its body up above the surface so that it can see what may be happening nearby. In this video, we will see a young gray whale spyhopping off the coast of California. [Click on video to start it. Video is about 30 seconds in length.]

Slide 20. Learning about animals that live their entire life in the ocean can be very difficult. Generally, most behaviors that we can see are only those that are visible from the surface. There is much, much more going on under the water! This lesson has shown you commonly observed whale and dolphin behaviors. Scientists try to interpret these behaviors to understand more about the whales. You can see that this could be very hard to do.

Slide 21. As we watch this final video clip, try and see how many different behaviors you can see the humpback whales doing. [Click on video to start it. You may want to play it a second...]

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
time and have the students call out the behaviors that they see. These include breaching, lobtailing, flipper slap, spouting and possibly spyhopping (or a weak breach). Clip is 1 minute 15 seconds.

NOTE: The video clips used in the PowerPoint presentation are all used with permission of the owners. Please contact the clip owner before using the clips in anything other than this curriculum.

Activities:


*Whale Behavior*, pgs 27-32

This workbook has a worksheet and activity that relates directly to this lesson on whale behavior. Pgs 28-29 have a poster that includes depictions and brief descriptions of the behaviors described in this lesson (and two feeding behaviors covered in Lesson 7). Pgs 30-32 have a simple whale puppet that can be made as an easy craft project. Students can then use the puppet to display the behaviors they have studied.

*Conducting Whale Research*, pgs 39-42.

This activity requires students to complete a (fictional) whale observation data sheet, and use the data sheet to plot the locations of whales on a simple map. Students then answer a few questions based on the chart/map.
Lesson 7: How do whales eat?

Objectives: Students will learn about the differences between how baleen and toothed whales feed. Students will learn how sound waves are used for echolocation.

You will need:

- Ability to project PowerPoint presentation
- Copy of PowerPoint presentation "Eating like a whale"
- Internet connection (to show some of the videos in the presentation)
- Optional: Speakers for PowerPoint presentation
- Investigating sound waves activity:
  - Tuning fork (s)
  - Copy of page 7-10 to project or printed copies to hand out to the students
  - Shallow clear pan of water
  - Elmo or overhead projector
- Dolphin Polo activity:
  - Five Blindfolds
  - Copies of page 7-9 for each student
- Eat like a whale activity:
  - Four plastic dishpans or similar plastic tubs
  - Container of dry parsley
  - 6 small plastic combs
  - Roll of paper towels
  - Pair of kitchen tongs
  - Pens for students to use to write on paper towels
  - Straws
  - Plastic sandwich bags
  - Small pieces of Styrofoam or other small floating objects (e.g. foam beads)


Strategy: There is an instructional PowerPoint presentation and several (optional) activities that reinforce concepts introduced in the presentation.

Presentation: Eating like a whale (PowerPoint)

Teacher Script

Slide 1. Today we are going to learn how different types of whales & dolphins get their food.
Slide 2. Baleen whales, or mysticetes (MISS-ti-seats), are some of the largest animals on the planet, but they eat very small food items. Many baleen whales eat plankton, which contains animals like copepods and krill. Some copepods are smaller than a grain of rice! Baleen whales may also eat small fish, which swim in large schools.
Toothed whales, or odontocetes (oh-DON-tuh-seats), eat larger prey items—usually fish, but sometimes invertebrates (animals without backbones) like squid. Sometimes they even eat other marine mammals.

[Note: if you have already taught Lesson 2, the students will have been introduced to the information on this slide, so it should be used as a review of previously-introduced information.] Since baleen whales are feeding on fairly small food items, they have to have a way to filter their prey out of the ocean water. The baleen in their mouths acts as this filter. However, different baleen whales have different feeding behaviors, as we will see in the next few slides.

There are three major feeding strategies for baleen whales—these are gulp feeding, skim feeding and bottom feeding. Whales that are related to each other use similar feeding strategies.

Gulp feeders, like blue whales and humpback whales, have throat pleats that allow them to take a large amount of water into their mouths. Look for these in the two videos that we are about to see. What you will not be able to see is that the whales use their tongues to push the water through the baleen after they have closed their mouths. This traps the fish and plankton on the inside of the baleen in the whale’s mouth. We will now see two videos of humpback whales feeding on small fish. In the second video, you will see the humpback using a technique called “bubble net feeding” to concentrate the fish into a small area to make it easier to feed on them.

Another method used by whales to group fish together is called kick feeding. This video shows a humpback whale named “Pinpoint” who is feeding using his tail to scare fish so that they group together in a school. When you watch Pinpoint kicking the surface, notice when his body position changes for a deep dive. When he finally comes back to the surface, his mouth is open exactly where he was “kicking” the surface with his tail!

In the next video, we will see a right whale using skim feeding. It is probably eating tiny copepods, which are about the size of a grain of rice. You will be looking at the tip of the whale’s upper jaw, and part of its head. You will see the baleen plates hanging from the top jaw. Right whales and bowhead whales both obtain food by skim feeding at the surface, although they also feed underwater.

The third type of feeding is called bottom feeding. Gray whales will roll on their sides and suck in mud, which contains many types of invertebrates. [Ask the class] What is an invertebrate? [Answer: An animal that does not have a backbone].

[You will need to click on the link to access the video from the Arkive website]

[You will need to click on the link to access the video from the Arkive website] The whale is swimming along on its right side—you can see mud streaming out of the back of its
mouth [at one point, the whale will right itself, and the students will be able to see it quite clearly].

Slide 14. Odontocetes or toothed whales do not have baleen to help them filter food out of the water; instead they rely on being able to grab larger prey items, like fish and squid. So how do they find their prey? They cannot always rely on being able to see their prey ...

Slide 15. ...so they use a process called echolocation to help them figure out where things are in the water. Odontocetes will produce a sound wave, which hits an object in the water and then bounces back to the animal that produced it. Based on the time taken for the sound to come back, the whale or dolphin can tell how far away the object is. Let's listen to some of the sounds produced by different toothed whales. [Click on the little speaker symbol next to any of the whales' pictures to hear the sound. Point out that some of the sounds are like drumbeats, some are squeaks and some are a combination of both.]

Slide 16. Odontocetes’ heads are specially designed for echolocation. They use the forehead region of their head, called the melon, to produce the sounds and transmit them into the water. When the sounds return, they are detected by the lower jaw, which carries the vibrations to the ear bones. Odontocetes do have ears, but they do not have ear lobes to help them trap sounds. This makes it hard to see the ears on whales and dolphins.

Slide 17. Toothed whales use many feeding strategies. These include suction feeding which is commonly seen by beluga whales. Belugas eat many prey items that dwell on the sea floor. They are able to pucker their lips and use suction to capture their food.

Slide 18. Herding is when a group of dolphins surround a school of fish to pack them as tightly as possible. Dolphins then take turns swimming through the school and feeding one at a time. [You will need to click on the link to access the video from the Arkive website]

Slide 19. Strand feeding is when toothed whales chase a school of fish or other prey into shallow water. The prey is pushed onto the shore and toothed whale lunges onto the shore to catch the prey in its mouth. [Click on the video clip to start it—it is narrated, so you will want to have the sound turned on. Clip lasts about 19 seconds].

Slide 20. When a group of dolphins uses a circle of mud to catch fish it is referred to as mud-ring feeding. The action usually begins with one dolphin swimming off in a burst of speed. It then dives below the surface, circling a shoal of fish, stirring up mud along the way. On cue, the other dolphins in the group move into position, forming a barrier to block off any underwater escape routes. As the circle of mud rises to the surface, the fish are trapped. Their only option is to leap clear out of the water and straight into the open mouths of the waiting dolphins.

Slide 21. Unfortunately, people often feed toothed whales. This may teach the animals to look for food from humans. This puts them in danger of being hit by boats, becoming entangled in fishing gear. They may become sick if they swallow a fishing lure or eat foods that are not part of their natural diet. For these reasons, it is illegal to feed marine mammals in the U.S. [Click on the video clip to start it—it is narrated, so you will want to have the sound turned on. Clip lasts about 30 seconds].

Slide 22. To summarize what we’ve learned about whale feeding: Baleen whales feed on relatively small prey items by gulping, skim feeding or bottom feeding. Toothed whales use echolocation to find their larger prey items, grab them with their toothy jaws and
swallow them whole. They use strategies such as suction, herding, mud-ring and stranding feeding to catch fish.

Activity: Investigating Sound Waves (modified from Sea World’s “Good Vibrations” activity)

This activity can be done as a demonstration, or as a series of stations for the students to rotate through in small groups—depending on the supplies available. The steps below assume that the teacher will be doing a demonstration.

1. Explain to the students that they will be learning about sound, which is a type of energy that can travel through gases, solids and liquids. Sound is the vibration of molecules. These vibrations travel in waves, and they travel at different speeds depending on what they are traveling through. Sounds travel slowest through gases (e.g. air), faster through liquids (e.g. water) and fastest of all through solids (e.g. bone). This is because gases, liquids and solids are all made up of particles called molecules. In gases, the molecules are far apart, in liquids they are closer together and in solids they are even closer together. You can use the diagram provided in this lesson (page 7-11) to illustrate this.

2. Explain that sound travels at about 340 meters/second (0.2 mile/sec) in air, but in water, sound can travel at about 1,600 meters/second (1 mile/sec). Write these numbers on the board.
   a. Ask the students whether sound travels faster in air or in water [WATER]
   b. Ask the students about how much faster sound travels through water compared to air [actual answer is 4.7; guesses of 4-5 times faster would be good ones]

3. Show the students a tuning fork. Explain that tuning forks are manufactured so that they when they are hit on the U-shaped portion of the fork, they produce sound waves that we hear as a particular musical note.

4. Show the students how to get sound from a tuning fork. Caution the class to be very quiet. Holding the fork by the single prong at the base of the U (don’t hold the U-portion), strike the side of the U-portion on a solid surface (it doesn’t need to be hard like rock; a solid rubber or plastic surface works well and won’t damage the tuning fork). You should hear a clear but faint humming sound for about 5 seconds or so. Ask the students to raise their hands if they were able to hear the sound. If necessary, repeat the process after moving to a new location in order to let everyone hear the sound. Explain that the students are hearing the sound because the sound waves are traveling through the air, into people’s ears, where our ear bones detect the waves as a musical note.

5. Encourage the students to cup their hands around their ears (simulating larger ear lobes) and repeat step 2. Keeping their hands cupped at their ears, ask the students to turn their backs to you and strike the tuning fork again. Have them turn back towards you, and remove their hands. Strike the tuning fork a third time. Ask the students whether they noticed any difference in the three steps. When did they hear the tuning fork the most clearly or loudest? [It should be when they were facing you with their hands cupped around their ears.] Explain that the cupped hands act to help trap the sound so our ears can hear it.

6. To show how sound waves travel through water, you will need a shallow pan (a clear plastic storage box works well) into which you have poured water to be about 1” deep. Set the pan
on an overhead projector or under an Elmo and allow the water to settle. With the Elmo (or if doing station rotations), you may want to put a dark sheet of paper or plastic under the pan. Hold a tuning fork by the handle, and strike the tines on a hard surface. While it is vibrating, place the tips of the tines in the water (slowly, or you will get a big splash!). Ask the students what they see and hear (you may need to repeat the process a couple of times). They should be able to see small ripples being created by the tuning fork, then spreading out away from the tuning fork. They may hear a faint sound from the tuning fork after it has been struck. Explain that the ripples that they are seeing are the sound waves being converted into water waves.

7. Remind the class that whales and dolphins do not have ear lobes. So, although sound waves will travel through water, these animals need another way to trap the sound waves so they can hear them. Ask if anyone remembers how they do this [it was in the slideshow]. They use their lower jaw! Explain that you are going to demonstrate how this works by striking a tuning fork and touching the bottom tip (the bottom of the part you are holding) to the lower jaw of one of the students. Ask for a student volunteer, and do this procedure. Ask the student what happened when you touched the tuning fork to their jaw. They should be able to hear the note more clearly, and perhaps be aware of a vibration in the jaw. Repeat this for any student who is willing.

8. Ask the students if they could hear the sound better when it was in air or when it traveled through their jaw [They should have heard it more clearly through their jaw]. Ask them why they think they could hear it better through their jaw. [The jawbone is a solid, so sound waves are transferred better through it than through air, which is a gas].

Activity: Dolphin Polo (see page 7-9 to 7-10)

Suggestion: set ground rules for movement (i.e. no running; require students to drag one foot when walking to ensure they move slowly)

Activity: Eat Like a Whale (modified from Jean-Michel Cousteau Ocean Adventures' Whale Adaptations activities on pbs.org)

1. Ahead of time, prepare supplies
   a. Cover tables or countertop with newspaper or towels.
   b. Fill four plastic tubs with water. Add about two tablespoons of dry parsley flakes to each tub. Place the tubs on top of newspapers or towels.
   c. Cut apart and laminate the “Feeding Instructions” cards (page 7-6 to 7-7). Place one of the cards next to each tub.
   d. Add some small pieces of Styrofoam or other floating objects to the “bottom feeders” tub. These represent fish or squid.
   e. Place four combs next to the “skimmers” tub and one next to each of the “gulpers” and “bubble feeders” tubs.
   f. Place a pair of tongs next to the “bottom feeders” tub.
2. Explain to the class that, for the purpose of this activity, the students are going to become cetaceans and are going to experiment with the different feeding styles that they learned about in the PowerPoint presentation. Ask if they can remember any of the different baleen whale feeding styles [skimming, gulping, bubble net feeding, bottom feeding]. Write these on the board.

3. Divide the class into four groups. Have each group come up with a group name. Give each group 4 paper towels and a pen. Ask them to write the word BOTTOM FEEDER on one paper towel, SKIMMER on another, GULPER on a third and BUBBLER on the fourth. Have them write their group’s name on the paper towels.

4. Give each group two plastic sandwich bags. Tell them that ONE bag is to be used with the “gulper” activity and one with the “bubbler” activity.

5. Give each group of students 3 or 4 straws (one less than the number of students in the group). Explain that these are to be used with the “bubbler” activity.

6. Explain that the groups of students will be rotating around all of the four stations. At each station, the students will simulate one of the whale feeding behaviors. The instructions for each station are at the station. [If desired, go ahead and briefly explain what is to be done at each station.]

7. Assign each group of students a starting location, and explain how they will rotate (e.g. when you tell them to, they will rotate to the right). Ideally, the students should leave all of their paper towels except the one they will be using at a dry location. Once they have completed one station, they should carefully bring that paper towel back to a central point, and collect the paper towel for their next location. [Make sure to have some desks set up with newspaper or towels on which to set the wet paper towels.]

8. Start the rotations. As the groups finish their assigned task, you may need to replenish the parsley in some of the tubs.

9. Once all of the students have completed the four rotations, have the students look at their four paper towels.
   a. Ask the groups: which type of feeding method seemed to catch the most prey?
   b. Discuss with the students—did all groups have the same answer to the question above?
   c. What types of food did the biters have the most success in catching?
      (parsley=plankton; floating beads or Styrofoam=fish or squid)
SKIMMERS:

Hold the back of a comb with your thumb and fingertips. Dip the teeth of the comb into the water as far as you can without getting your fingers wet. Use the comb to try and scoop parsley (‘plankton’) out of the water. Tap the bottom of the comb on the paper towel labeled “Skimmer” to make the parsley fall onto the paper towel. Each person in the group should make one scoop with the comb. Leave the combs next to the tub.

GULPERS

One person should take a plastic bag and use it to scoop up some water and parsley. The other people should hold combs over the tub of water (so the combs are on their sides). The first person should carefully pour the water (VERY SLOWLY) over one of the combs, trying to trap the parsley on the comb. It might be helpful to almost seal off the top of the bag with your hands so only a small amount of water can come out of the bag at a time. Once there is some parsley on the comb, switch to another comb. Each person holding a comb should periodically tap the comb onto the paper towel labeled “Gulper” then continue collecting parsley. Do this until all of the water has been drained from the bag. Leave the combs next to the tub. Throw the bag in the trash.

BOTTOM FEEDERS

One person at a time, take the tongs and use them to try and grab food (plankton, small fish, squid) out of the water. Put any prey that you catch onto the paper towel labeled “Bottom feeder.” Repeat. Pass the tongs to the next person, who will repeat these steps. Leave the tongs next to the tub when finished.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
BUBBLERS

One person should hold a plastic bag by its flaps so it is open. They should then carefully submerge the bag until it is on the bottom of the pan. All of the other team members should use straws to create a bubble ring in the water. You can move the bottom of your straw to try and concentrate the food into the middle of the pan (over the bag). The person holding the bag should then raise the bag up, filling it with as much parsley as they can. One of the people who had a straw will now need to hold a comb over the tub of water (so it is on its side). The person holding the bag will carefully pour the water (VERY SLOWLY) over the comb, trying to trap the parsley on the comb. If might be helpful to almost seal off the top of the bag with your hands so only a small amount of water can come out of the bag at a time. Once there is some parsley on the comb, stop pouring water and tap the comb onto the paper towel labeled “Gulper” then continue collecting parsley. Do this until all of the water has been drained from the bag. Throw your straws and the bag away. Leave the comb next to the tub.
Dolphin Polo

OBJECTIVE

The student will play a game to experience how dolphins use echolocation to find their food.

ACTION

1. Write on the board or show the word echolocation. Circle the two smaller words: echo and location. Ask students if they know what each word means. Explain that dolphins find food and each other by using echoes. Echolocation is a way that dolphins “see” by using sounds. Show page 2 to help illustrate echolocation.

2. To begin the game, have the students hold hands and form a circle about 3 to 4.5 m (10 to 15 ft.) across. Blind-fold a volunteer “dolphin” and steer him or her to the center of the circle. Choose five students to be “fish.” “Fish” stand inside the circle.

3. Explain that the game Dolphin Polo is played like “Marco Polo.” The dolphin calls out “dolphin” (similar to real dolphins sending out clicking sounds), and the fish respond by calling “fish” (similar to the echoes that bounce back). The dolphin tries to find the fish by following the sounds of their voices. When the dolphin tags a fish, the fish sits outside the circle.

4. After a few minutes, call a time-out and ask the students what would help the dolphin catch the fish. In the ocean, dolphins hunt together in pods. Add a few blindfolded dolphins to the center of the circle and see if the hunting gets any easier.

BACKGROUND

Dolphins make clicking sounds that they send through the water. When the clicks hit an object, the sound waves bounce back, or “echo,” to the dolphin. This activity is called echolocation. A dolphin can get a lot of information from these echoes. For instance, a sound that bounces off a rock is different from a sound that bounces off a fish. Echoes from near objects bounce back faster than echoes from far objects. So, dolphins can use echolocation to tell how far away an object is, how big it is, what shape it is, and if it’s moving. Echolocation helps dolphins stay together, find food, avoid predators, and steer through dark, murky water.

MATERIALS

☐ a large play area, at least 6 by 9 m (20 by 30 ft.)  ☐ five blindfolds  ☐ copy of page 2

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Dolphin Polo Echolocation Chart

1. A dolphin sends “clicks” into the water through its melon.
2. The clicks hit an object, then bounce back to the dolphin.
3. The echoes reach the dolphin’s lower jaw.
4. The echoes from the object tell the dolphin the object’s size, shape, and location.

A dolphin creates sounds by moving air between nasal sacs that lie beneath its blowhole. The clicks pass through the fat-filled melon (the rounded region of a dolphin’s forehead) and are focused into a beam that is projected forward into the water. The sound waves in this beam bounce off objects in the water and return (to the dolphin) in the form of an echo, which is received by the dolphin’s lower jaw.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Diagram to show how molecules (black dots) are spaced in gases, liquids and solids.
Lesson 8: Food Chains

Objectives: Students will identify components of and trace energy flow in baleen & toothed whale food chains.

You will need:

- Copy of Whale Food Chain activity sheets (pages 8-5 through 8-7) for each student
- Scissors for each student
- Glue sticks or clear tape
- Optional: Computer with internet access and projector (or smartboard)
- Optional: Laptops/computers with internet access for each student or small groups of students
- Whiteboard and colored markers

Vocabulary:

- Food Chain
- Predator
- Prey
- Producer
- Consumer
- Baleen whales
- Toothed whales
- Phytoplankton
- Zooplankton
- Herbivore
- Carnivore
- Omnivore

Sunshine State Standards: SC.4.L.17.2; SC.4.L.17.3; SC.4.L.17.4

Strategy:

1. (Optional) Watch Magic School Bus Gets Eaten (Season 1 Episode 4) to introduce the concept of food chains. This can be accessed via the YouTube link: [http://www.youtube.com/watch?v=eYY_NpTt390](http://www.youtube.com/watch?v=eYY_NpTt390) (22 min)
2. Explain to students that this lesson will focus on food chains. If you have previously introduced the concept of food chains, you may want to skip to #12.
3. Remind students that all living things depend on each other to survive. Explain that a food chain shows the relationships between plants and animals in an environment.
4. In a food chain, there are two basic levels: producers and consumers. Remind students that plants are called producers because they can make their own food. Ask students if they remember where plants get the energy to make their own food [from the sun].
5. Write the word SUN and the word PLANT on the board. Connect them with an arrow pointing from the sun to the plant [SUN ——> PLANT]. Explain that the arrow shows what direction the energy is flowing (i.e. from the sun to the plant).
6. Write the word “producer” underneath PLANT on the board.
7. Ask students to tell you the name of something that eats plants. Choose one of these answers and write it on the board, with an arrow pointing from PLANT to the animal (e.g. COW).
8. Write the word “consumer” underneath COW. Explain that consumers cannot make their own food, so they have to get their energy from eating other things.

9. Ask students if they can think of an animal that eats the animal you listed on your food chain (using the example of cow, answers could include humans, lions, etc.). Add this animal to the food chain.

10. You should now have something that looks like this:

```
SUN → PLANT → COW → LION
Producer       Consumer       Consumer
```

11. Explain to the students that what you have just created is called a food chain. Ask them to remember what the arrows show [the flow of energy through the food chain]. Point out that there will always be a producer at the start/bottom of a food chain. Explain that consumers are animals, but that some consumers eat only plants, others eat only animals/meat and others eat a combination of plants and animals.

12. Ask students if they can think of an example of an animal that only eats plants. List correct answers on the side of the board. Explain that these animals are called herbivores. Many herbivores have only molars (grinding teeth) in their mouths. Some students may be familiar with the term vegetarian; if so, explain that vegetarian is a term used for humans who do not eat meat.

13. Ask students if they can think of an example of an animal that only eats meat. List these animals on the board using a different colored marker. Explain that these animals are called carnivores.

14. Ask students if they can think of an example of an animal that eats both plants and animals (humans is the obvious example). Explain that animals that eat both plants and animals are called omnivores.

15. (Optional, but recommended) If you have internet access, you may want to do the interactive food chain activity at [http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm](http://www.ecokids.ca/pub/eco_info/topics/frogs/chain_reaction/index.cfm). This could be done as a class (with the website projected) or individually if laptops or computer stations are available. This is a good activity as it includes having links in the food chain removed and shows what could happen as a result.

16. Give each student a copy of the Whale Food Chain activity sheet for “baleen and toothed whales”. Point out to students that the organisms for the baleen whale food chain box are on the left side of page 8-7 and those for the toothed whale food chain are on the right side of that page. Review each of the organisms with the students (copepods are animals that are part of the plankton and eat phytoplankton; phytoplankton are tiny plants that float around in the water; fish eat copepods; right whales eat copepods; orcas eat fish).

17. Point out that students need to use ALL of the possible organisms when creating each of their food chains. Students should cut out each of the organisms and glue or tape them into the appropriate box. They will then draw arrows to show the energy flow through the two food chains, so they should think about the energy flow before sticking their organisms onto the paper. Ask the students what direction the arrows should point [from the thing giving the energy to the thing taking the energy, or from the thing being eaten to the thing doing the eating].

This activity is available online at [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
Point out to the students that the instructions say to draw a triangle around the producer (what is a producer?) and a circle around the consumers.

18. Once students have completed the activity, review the food chains with them. Ask the students to compare and contrast the two food chains. Select items in the food chain and ask the students where each of these gets its energy. Ask what might happen to the toothed whale food chain if people created better fishing nets and were able to catch lots more fish than they have been catching. [If fish were removed from the food chain, toothed whales might starve, copepods would increase and phytoplankton might decrease.] Might this have an effect on right whales? [If there are more copepods, that could mean more food for right whales...and that would lower the grazing pressure on the phytoplankton, so the phytoplankton wouldn’t all get eaten.]

Optional Activities:

Have students create a food chain from one meal that they have eaten in the last 48 hours. Students will list everything they ate during the meal, and then draw the various types of plants and animals which helped create their meal. Draw arrows to show the energy flows. Draw a triangle around the producers, circle the consumers. Remind students not to forget to include themselves and the sun in their food chain!

Give your students the list of vocabulary words and have them write a short story using the words correctly. Use the rubric below to score their work. Addresses Common Core Standards: CCSS.ELA-Literacy.RI.4.4; CCSS.ELA-Literacy.W.4.2; CCSS.ELA-Literacy.W.4.3; CCSS.ELA-Literacy.W.4.4

References:

- Optional activity adapted from Oregon Coast Aquarium:
## Grading Rubric

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Gained</td>
<td>Student could easily and correctly use all of the vocabulary words in their story.</td>
<td>Student could easily and correctly use 3 to 4 of the vocabulary words in their story.</td>
<td>Student could easily and correctly use 1-2 of the vocabulary words in their story.</td>
<td>Student could NOT correctly use any of the vocabulary words in their story.</td>
<td></td>
</tr>
<tr>
<td>Creativity</td>
<td>The story contains many creative details and/or descriptions that contribute to the reader’s enjoyment. The author has really used his imagination.</td>
<td>The story contains a few creative details and/or descriptions that contribute to the reader’s enjoyment. The author has used his imagination.</td>
<td>The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.</td>
<td>There is little evidence of creativity in the story. The author does not seem to have used much imagination.</td>
<td></td>
</tr>
<tr>
<td>Setting</td>
<td>Many vivid, descriptive words are used to tell when and where the story took place.</td>
<td>Some vivid, descriptive words are used to tell the audience when and where the story took place.</td>
<td>The reader can figure out when and where the story took place, but the author didn’t supply much detail.</td>
<td>The reader has trouble figuring out when and where the story took place.</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Several action verbs (active voice) are used to describe what is happening in the story. The story seems exciting!</td>
<td>Several action verbs are used to describe what is happening in the story, but the word choice doesn’t make the story as exciting as it could be.</td>
<td>A variety of verbs (passive voice) are used and describe the action accurately but not in a very exciting way.</td>
<td>Little variety seen in the verbs that are used. The story seems a little boring.</td>
<td></td>
</tr>
<tr>
<td>Characters</td>
<td>The main characters are named and clearly described in text as well as pictures. Most readers could describe the characters accurately.</td>
<td>The main characters are named and described. Most readers would have some idea of what the characters looked like.</td>
<td>The main characters are named. The reader knows very little about the characters.</td>
<td>It is hard to tell who the main characters are.</td>
<td></td>
</tr>
</tbody>
</table>

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Whale Food Chain Worksheet

Baleen Whale Food Chain
Whale Food Chain Worksheet

Toothed Whale Food Chain

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
INSTRUCTIONS: Cut out these pictures and stick them onto the baleen whale food chain (pictures on the left) and toothed whale food chain (pictures on the right) worksheets to create food chains. Draw arrows to show the direction of energy flow in the food chains. Draw a TRIANGLE around the producer in each food chain. Draw a CIRCLE around each of the consumers in the food chains.
Lesson 9: How do whales stay warm?

Objectives: Students will investigate the roles that insulation (blubber) and body shape/size play in preventing heat loss in marine mammals.

You will need:

For blubber glove:
- two 1-gallon zipper-seal bags
- 1 large container shortening
- duct tape
- small bucket or dishpan
- ice
- water

For oatmeal labs:
- 3 cups cooked oatmeal per group of 4-5 students
- 1/2 cup and 1 cup measuring cups
- Spoons
- Wax paper (4 approximately square sheets per group of students)
- Thermometers (2 per group of students)
- Data sheets (pages 9-7 to 9-9)—one of each per group of students
- Pieces of masking tape (about 6” long)—4 per group of students
- Paper towels
- Copies of activity page (page 9-10)—one per student.

Standards: CCSS.Math.Content.4.OA.A.2; CCSS.Math.Content.4.MD.A.2

Sunshine State Standards: SC.4.L.16.2; SC.4.P.11.1

Comment: The blubber glove activity in this lesson is also an optional activity in the 3rd grade manatee curriculum designed by the same authors. If a school is using both curricula, 4th grade students may already have been exposed to the blubber glove.

Vocabulary: hypothermia, blubber

Strategy:

Ahead of time (can be done days or weeks in advance):

1. Make a blubber glove. To do this, take two 1-gallon plastic bags. Fill one bag about half-way full with shortening, trying to keep the shortening all in the bottom of the bag. Take the second gallon bag, and put it inside the first bag, so the shortening is sandwiched between the two bags. Be careful not to push shortening out of the top of the bags! Use duct tape to seal the openings of the two bags together. DO NOT seal the two sides of the inside bag together!

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Before class:

2. Put water into a bucket, dishpan or similar container. The water should be at least 6” deep, but do not fill the container too full or water will get spilled during the activity.
3. Cook some oatmeal (3 cups per group of 4-5 students). Keep it warm in a crockpot set on low. It should be fairly thick.

During class:

4. Explain to students that today's lesson will investigate how whales manage to stay warm even if they live in very cold water. Ask the students how they stay warm when it is cold [Answers might include wearing a jacket, hat or gloves, staying inside with the heater on, drinking hot chocolate, etc.] Ask if whales can use any of these same strategies [No]. So how do whales stay warm? [Some students may know about blubber, which is one correct answer.]
5. Ask the students if any of them have ever felt cold when they were swimming, even on a warm day. Explain that human body temperature is about 98.6 degrees Fahrenheit or 37 degrees Celsius. This is similar to the body temperature of whales and dolphins. If the water temperature is cooler than our body temperature, the heat from our body will be drawn into the water to try and equal out the temperature between the water and our body. In water, this heat transfer is about 25 times faster than in air, so people will get hypothermia faster in cold water than in cold air. Hypothermia occurs when a person's body temperature falls below 95 degrees Fahrenheit. It causes the body's organs to be unable to work properly, and can result in death.
6. So, for a warm-blooded animal that lives its entire life in water, heat loss is something that the animal needs to be able to prevent. Explain that the class will get to feel how it is that blubber helps to keep the whale from losing body heat. Add ice to one of the two containers of water. Show the students the blubber glove, and explain that the shortening in the glove will act like blubber to help keep their hands warm in cold water.
7. Place the bottom of the blubber glove into the ice water. Invite a student to put one hand inside the blubber glove. Ask them to put their other hand into the ice water without the blubber glove. Let each student try this. In between students, you may need to redistribute the shortening so there is an even layer between the bags.
8. Explain to the students that the blubber is important in helping keep whales warm, but that their body shape also helps keep them warm.
9. Explain that the class is going to do some experiments to look at how body size and shape can affect heat loss. These two experiments combined take about 45 minutes. You may wish to have half of the class do the first experiment and the other half do the second experiment. The activity sheet on page 9-10 can be used to help keep students busy when they are not actively conducting an experiment.
10. Divide the class into groups of 4-5 students.
11. Give each group two thermometers, a stopwatch, two data sheets and two pieces of wax paper.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
12. Assign students roles (two are temperature readers, one is timekeeper and one or two are data recorders). Ask the students to record the room temperature on the data sheets.

13. Explain that you will be giving each group two portions of oatmeal.

14. Demonstrate that they will use the wax paper to make one portion into a ball, and one into a flattened disk about a half-inch in thickness. Explain that they will need to do this quickly; then show them how to stick the tip of a thermometer into each of the oatmeal shapes and record the temperatures. The thermometer should be inserted into the center of the oatmeal. Explain that they will leave the thermometer in place, and read the temperatures every minute. It will be easiest if the students use masking tape to hold the wax paper and thermometer in place. The timekeeper will call out each minute, the temperature readers will read off the temperature, and the data recorders will record the temperatures on the data sheet.

15. Ask each group to complete the hypothesis on their data sheets (fill in the blank with either the word “round” or “flat”).

16. Give each group ½ cup of oatmeal on each of their sheets of wax paper, and tell them to begin (each group should start as soon as they get their oatmeal.)

17. Once both of the lumps of oatmeal have cooled to room temperature (or after 15 minutes, whichever comes first), have the students remove the thermometers and set them aside. They should throw their wax paper and oatmeal in the trash, and come and get two more pieces of wax paper and two new data sheets.

18. When all groups have completed the first oatmeal experiment, discuss the results. Which oatmeal shape cooled the fastest? See if the students can come up with an explanation as to why the flatter shape cooled more quickly. Remind them that both shapes cooled because the heat from the oatmeal flowed into the air to try and equal out the temperatures between the air and the oatmeal. The flatter shape cooled faster because the heat had a shorter distance to travel to get from the middle of the oatmeal to the air.

19. Explain the second oatmeal experiment. In this experiment, the students will get two different sized portions of oatmeal. They will shape both into balls, using the wax paper as before. They will again record the temperatures in the center of the oatmeal over time. Reassign student roles if desired.

20. Ask the students to form a hypothesis for this experiment (the hypothesis should answer the question, which ball, the small one or the large one, will cool the fastest?)

21. Give each group of students a ½-cup portion of oatmeal on one piece of wax paper and a 1-cup portion on the other. Have them begin the experiment. Note that they will record the temperatures every five minutes for this experiment. If possible, have the time keeper use the countdown feature of the stopwatch as an “alarm” every 5 minutes.

22. After 30 minutes, have the students remove the thermometers, wipe them with a damp paper towel and set them aside. They should throw their wax paper and oatmeal in the trash.

23. When all groups have completed the second oatmeal experiment, discuss the results. Which oatmeal shape cooled the fastest? The smaller ball should have cooled the fastest, for the same reason as in the first experiment.
24. Ask the class to come up with the best body size and shape for an animal that lives in very cold water (large and round—to conserve energy loss).

References:

- Experiments modified from “Cool shapes” activity by Sea World—Arctic Animals 4-8 Teacher's guide.
STUDENT INSTRUCTIONS

OATMEAL LAB #1

1. Data recorder #2: read the room temperature off one of the thermometers and record it on both data sheets.
2. Timekeeper: Use the wax paper to gather up one portion of oatmeal into a ball.
3. Data recorder #1: Use the wax paper to shape the other portion of oatmeal into a disk that is about $\frac{1}{2}$” thick. The thick line at the right side of this paragraph is $\frac{1}{2}$” long.
4. Temperature reader #1: Place the tip of one thermometer into middle of the oatmeal ball. Read off the temperature. Use a piece of masking tape to gather the wax paper around the thermometer and hold it in place.
5. Data recorder #1: write down the temperature in the correct space on the data sheet.
6. Timekeeper: start the stopwatch.
7. Temperature reader #2: Place the tip of the second thermometer into the middle of the oatmeal disk. Read off the temperature. Use a piece of masking tape to gather the wax paper around the thermometer and hold it in place.
8. Data recorder #2: write down the temperature in the correct space on the data sheet.
9. Timekeeper: call out each minute. Repeat steps 4, 5, 7, 8 and 9 until you have made observations for 15 minutes.
10. Wipe off the thermometers and set them aside. Throw your oatmeal and wax paper into the trash.
11. See your teacher for more wax paper and new data sheets.
STUDENT INSTRUCTIONS

OATMEAL LAB #2

1. Timekeeper: Use the wax paper to gather one portion of oatmeal into a ball
2. Data recorder #2: Gather the other portion of oatmeal into a ball.
3. Temperature reader #1: Place the tip of one thermometer into the middle of the small oatmeal ball. Read off the temperature. Use a piece of tape to hold the thermometer and wax paper in place.
4. Data recorder #1: write down the temperature in the correct space on the data sheet.
5. Timekeeper: start the stopwatch.
6. Temperature reader #2: Place the top of the second thermometer into the middle of the large oatmeal ball. Read off the temperature. Use a piece of tape to hold the thermometer and wax paper in place.
7. Data recorder #2: write down the temperature in the correct space on the data sheet.
8. Timekeeper: call out every 5 minutes. Repeat steps 4, 5, 7, 8 and 9 for a total of 30 minutes.
9. Wipe off the thermometers with a damp paper towel and set them aside. Throw your oatmeal and wax paper into the trash.
Data sheet
Oatmeal lab 1

Hypothesis: We think that the _______________ (round or flat?) oatmeal will cool the fastest.

The air temperature is __________ °F (____________ °C)

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature of round ball of oatmeal</th>
<th>Temperature of flattened disk of oatmeal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial reading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 minute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Temperature of round ball of oatmeal</td>
<td>Temperature of flattened disk of oatmeal</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>11 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What was the total change in temperature for
   a) The round ball of oatmeal? ____________
   b) The flattened disk of oatmeal? ____________

2. Which one cooled the fastest (lost the most heat)—the round ball or the flat disk? ___________________________
Data sheet  
Oatmeal lab 2

Hypothesis: We think that the ____________ (small or large?) ball of oatmeal will cool the fastest.

The air temperature is ___________ °F (____________ °C)

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature of small ball of oatmeal</th>
<th>Temperature of large ball of oatmeal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial reading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What was the total change in temperature for

   c) The small ball of oatmeal? ____________

   a) The large ball of oatmeal? ____________

2. Which one cooled the fastest (lost the most heat)—the small ball or the large ball? __________________________
Activity Sheet

Name: ___________________________

Did you know...? A bowhead whales’ blubber can be 17-19 inches thick! One inch = 2.5 centimeters. How many centimeters thick is a bowhead whale’s blubber? _________________________________

How many new words can you make from the letters BOWHEAD WHALE? Try to come up with at least as many words as there are numbered spaces in the table. You can write down more than the numbered amount of words if you can think of them!

<table>
<thead>
<tr>
<th>2-letter words</th>
<th>3-letter words</th>
<th>4-letter words</th>
<th>Words with more than 4 letters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1.</td>
<td>1.</td>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
<td>2.</td>
<td>2.</td>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
<td>3.</td>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
**Answers for activity sheet**

A bowhead whale’s blubber is **42.5 to 47.5 cm** thick.

Suggested words from BOWHEAD WHALE. Note that this is not an exhaustive list of words:

- Abode
- Adobe
- Ah
- Aha
- Ale
- Awe
- Awed
- Awl
- Bad
- Bawl
- Be
- Bead
- Bee
- Bow
- Bowed
- Bowl
- Bowled
- Dab
- Dale
- Deal
- Dew
- Doe
- Eel
- Had
- Hale
- Haw
- Hawed
- He
- Head
- Heal
- Healed
- Heed
- Heel
- Hew
- Hewed
- How
- Howled
- Howl
- Law
- Lead
- Led
- Lee
- Low
- Ode
- Owe
- Owed
- Owl
- Wade
- We
- Wean
- Weaned
- Web
- Weed
- Weld
- Wheel
- Who
- Wow
- Wowed
Lesson 10: Summarizing what we know about cetaceans

Objective: Students will learn about different types of poetry, and will write poems to express what they know about whales and dolphins.

You will need:

- Copies of Examples of Poems (pages 10-4 to 10-5) for each student
- Copies of Poetry Planning Worksheet (page 10-6) for each student
- Cetacean fact sheets, computers with internet access and/or cetacean reference books


Strategy:

1. Explain to students that the class will be learning about different types of poetry, and that each student will be writing a poem.
2. Ask the students what they know about poems or poetry. Write any responses on the board. These might include that poems have words that rhyme, or that poems are funny.
3. Explain that there are many different types of poems. All are creative ways of expressing thoughts, facts or emotions. Some poems can be funny, some can be sad. Some have lines that rhyme, some do not.
4. Hand out copies of "Examples of poems" to each student.
5. Either read, or select students to read aloud, the explanation of each type of poem, and the example on the sheets. Be sure to carefully explain the structure of each type of poem.
6. Make sure that students know what a syllable, synonym, adjective, and noun are.
7. Tell students that they will be creating poems about cetaceans. They should use knowledge/information that they have gained from the first lessons in the curriculum when writing their poems (i.e. the poems should contain facts and not be completely fictional).
8. Give each student a copy of the Poetry Planning Worksheet and any reference materials you want them to have (fact sheets from this curriculum, computers with internet access, books etc.)
9. Ask students to complete the planning worksheet.
10. Once students have selected a topic, done some research and chosen a type of poem, have them write the first draft of their poem.
11. Divide students into small groups and have them read their draft poems aloud to each other. Remind them that these poems are DRAFTS, which means that others in the group may have suggestions about ways the poems could be improved. Encourage students to be constructive with their criticism. Remind them that it is more helpful to suggest a specific way to improve the poem than to say something like, “I didn't like the second line.”) Also remind them that different people often have different opinions about things, and that opinions show personal preferences, so there are no “right” or “wrong” opinions. Similarly, the author of the poem may choose to take advice from others in the group, or may choose to stick with the original draft version of the poem.
12. Once everyone in the group has read their poem and received feedback, allow some time for students to revise their poems if they wish.
13. Allow students to illustrate their poems. This may be done by hand, or could be done electronically (using Word, PowerPoint or Publisher to create a poster that incorporates the poem as well as graphics).
14. A suggested grading rubric is provided (page 10-3).

References:

- Examples of Poems from [http://www.pbs.org/newshour/extra/features/jan-june00/poetryboxformexamples.html](http://www.pbs.org/newshour/extra/features/jan-june00/poetryboxformexamples.html)
# Poetry Rubric
Writing and illustrating a poem.

<table>
<thead>
<tr>
<th></th>
<th>Beginning 1</th>
<th>Developing 2</th>
<th>Accomplished 3</th>
<th>Exemplary 4</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Form</strong></td>
<td>Uses an inappropriate poetic form.</td>
<td>May use an appropriate poetic form.</td>
<td>Effectively uses an appropriate poetic form.</td>
<td>Creatively uses an appropriate poetic form.</td>
<td></td>
</tr>
<tr>
<td><strong>Word Usage</strong></td>
<td>Student’s use of vocabulary is very basic.</td>
<td>Student’s use of vocabulary is more telling than showing.</td>
<td>Student’s use of vocabulary is routine and workable.</td>
<td>Student’s use of vocabulary is precise, vivid, and paints a strong clear and complete picture in the reader’s mind.</td>
<td></td>
</tr>
<tr>
<td><strong>Language Conventions</strong></td>
<td>May contain frequent and numerous errors in spelling, grammar, and punctuation that interferes with the reader’s understanding.</td>
<td>May contain many errors in spelling, grammar, and/or punctuation that may interfere with the reader’s understanding.</td>
<td>Has mainly grade-level appropriate spelling, grammar, and punctuation; contains some errors that do not interfere with the reader’s understanding.</td>
<td>Has grade-level appropriate spelling, grammar, and punctuation; contains few, if any, errors that do not interfere with the reader’s understanding.</td>
<td></td>
</tr>
<tr>
<td><strong>Effort</strong></td>
<td>Student’s work lacks understanding of the assignment.</td>
<td>Student’s work demonstrates some understanding of the assignment.</td>
<td>Student’s work demonstrates an understanding of the assignment.</td>
<td>Student’s work demonstrates a complete understanding of the assignment and goes beyond the requirements.</td>
<td></td>
</tr>
<tr>
<td><strong>Illustration</strong></td>
<td>Lacks an illustration.</td>
<td>Uses an illustration that may add to the poem’s meaning.</td>
<td>Uses an illustration to enhance the poem’s meaning.</td>
<td>Effective and creative use of an illustration enhances the poem’s meaning.</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL SCORE:**
Examples of Poems

**Acrostic:** poetry in which the first letter of each line, when read vertically, spell out a word. The word is usually the subject of the poem.

*Vanilla*
*As I eat it on my brownie*
*Not doubting it’s sweet*
*Ice cream is a tasty treat*
*Lots of lingering taste*
*Lasting to the end*
*Always my favorite!*

**Cinquain:** a poem with five lines. Each has a required number of syllables, and a specific topic.

Line 1: Title (noun)- 2 syllables
Line 2: Description- 4 syllables
Line 3: Action- 6 syllables
Line 4: Feeling (phrase)- 8 syllables
Line 5: Title (synonym for the title)- 2 syllables

*Flowers*
*Pretty, fragrant*
*Waiting, watching, weeding*
*Enjoying all the while they grow*
*Gardens*

**Quatrain:** rhyming poems of four lines. Poets use letters to express the rhyme pattern or scheme. The four types of quatrain rhyme are: AABB (shown in the example), ABAB, ABBA, and ABCB.

*Picnic planning in July*
*Traveling up the mountains so high!*
*What an adventure for me*
*Because I prefer mountains to sea!*

**Limerick:** a whimsical poem with five lines. Lines one, two, and five rhyme with each other and lines three and four rhyme with each other. Rhyme pattern: AABBA

*A flea and a fly in a flue*
*Were caught, so what could they do?*
*Said the fly, "Let us flee."
"Let us fly," said the flea.
So they flew through a flaw in the flue.*
Diamonte: diamond-shaped poems of seven lines that are written using parts of speech.
Line 1: Noun or subject
Line 2: Two Adjectives
Line 3: Three 'ing' words
Line 4: Four words about the subject
Line 5: Three 'ing words
Line 6: Two adjectives
Line 7: Synonym for the subject

Home
Safe, caring
Loving, sharing, talking
Friendship, food, car, travels
Living, loving, enjoying
Joyous, adventurous
Family

Concrete/shape poem: poem that form a visible picture on the page. The shape usually reflects the subject of the poem.

Trees blossoming in the spring
Clouds above give rain
Fruit will come soon
Nature is at work
while
trees
stand
still

Free verse: poetry without rules of form, rhyme, rhythm, or meter.

What do the oceans do at night?
Do they tease and tickle the bottom of boats?
Do they ripple away in fright?
Or are the beaches like coats
That keep them still and quiet
And once the day breaks and it’s breakfast time
Do the oceans wish for some other diet than fish?
Poetry Planning Worksheet

1. What will your poem be about? You can choose one species of cetacean, or a group of cetaceans, or cetaceans in general. Write your answer in the space below.

_______________________________________________________________

2. Use reference materials (fact sheets, internet, books) to do some research about your cetacean to use in your poem. Write down at least 3 interesting facts about your cetacean(s). Use these questions as suggested places to start: What does it look like (size/color/appearance)? Where does it live? What does it eat? Does it have any unusual behaviors?

   a. ___________________________________________________________________

   b. ___________________________________________________________________

   c. ___________________________________________________________________

   d. ___________________________________________________________________

   e. ___________________________________________________________________

3. What type of poem do you want to write? Use the Examples of Poems sheet to help you choose a type of poem.

______________________________________________________________________

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Lesson 11: Introduction to Right Whales

Objectives: Students will learn about North Atlantic right whale life histories. Students will read an informational publication about right whales and will use information from the publication to complete worksheets.

What you will need:
- Copies of the reading material (handout) for each student (page 11-2 to 11-6).
- Copies of the worksheet for each student (page 11-7 to 11-10).
- Suggested: copies of humpback whale fact sheet (from Lesson 3).

Standards: CCSS.ELA-Literacy.RF.4.4

Strategy:
1. Remind the students that they have been learning about different kinds of cetaceans. Now they are going to spend some time learning more about one particular cetacean, the North Atlantic right whale.
2. Provide each student with a copy of the reading material (handout).
3. Provide each student with a copy of the worksheet. Ask them to complete the worksheet as they read through the article on right whales. You will probably want to have humpback whale fact sheets or other reference materials available to help with comparison between humpbacks and right whales.
Introducing ....
the Right Whale!

Why do we call these whales
the “Right Whales”?

More than 1000 years ago, humans did not get oil from oil wells. Instead, oil was made from animal products. Whales, because of their massive size and thick layers of blubber, were an excellent source of oil.

The “right whale” was named because it was the right whale to hunt. Right whales are found close to shore. They swim very slowly, usually at the surface. When the whales were killed, the body would float. This made it easier for the whalers to harvest the animal.

By 1935 there were very few North Atlantic right whales left. People could not make money hunting them any more. Right whales became protected. The Marine Mammal Protection Act was created in 1972. This prevents commercial hunting of all types of whales in United States waters. Today, native Alaskan people are allowed to hunt a few bowhead whales each year. No other whaling is allowed in US waters.

Is there only one “Right Whale”?

There are three different populations of right whales. The one seen in Florida waters is the North Atlantic right whale. That is the one we will talk about the most. There are about 450 whales in the North Atlantic population.

There is also a North Pacific Right Whale. These whales are found off the coast of Japan. There are very, very few North Pacific Right Whales left.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
The Southern Right Whale is found off the coast of South America, Africa and Australia. This group of right whales is doing very well and there are several thousand animals in this population.

**Fun Facts about Right Whales**

Right whales are baleen whales. They can grow to 55 feet in length and weigh 140,000 pounds.

Right whales are “skim feeders”. They swim at the surface with their mouth open to catch plankton.

In Florida, female right whales visit the ocean area between Jacksonville and Daytona Beach in the winter. This is where the calves are born. In March or April they begin to migrate north and spend the summer feeding in waters near Massachusetts and Canada.
Right whales have “callosities” on their heads. These are patches of skin that are covered with little white bugs called “cyamids”. The cyamids are also sometimes called whale lice. They do not seem to bother the right whales. The callosities on each whale form a unique pattern. Callosities are used like a fingerprint to identify individual right whales.

**Callosities** (circled spots) are used to identify individual animals. The callosity pattern is like the whale’s fingerprint!

**Cyamids** are tiny creatures sometimes called “whale lice”. Their white color makes the callosities visible to scientists who identify the whales.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Right whales in Florida

Right whales come to Florida every winter. Pregnant cows begin arriving in December. The calves are born over the next few months. The right whales usually head north to their summer feeding grounds in March or April.

In some years only one or two new calves join the herd. In other years there may be as many as 20-30 new calves. Currently, there are only about 450 North Atlantic right whales.

Summer Feeding

Right whales feed off the coast of New England and off southeastern Canada, in a place called the Bay of Fundy. This is a very special place with water that is full of tiny plankton. Plankton is the main food for hungry right whales.

Right whales catch plankton by SKIMMING the surface of the water with their mouth open. They trap the plankton in their baleen.

Scientists watch the whales all summer while they are feeding in the Bay of Fundy. They photograph as many whales as possible. They compare their photographs to photographs of known right whales. This allows them to identify the whales they have seen. Researchers study the whales and check on the new calves.
The Bay of Fundy is a very large area. It can be difficult for scientists to find the whales. One method is using spotters who look for whales from airplanes. This is expensive and can be dangerous.

Biologists often collect data from small planes. They take photographs to count whales when they surface for air.

**Fun Fact: Whale-Tracking Dogs!**
Another way scientists find the whales is by using dogs. Whale-tracking dogs are trained to smell whale poop. (Yes, you read that right...whale poop!). The dogs sit on the front of the scientist's boat. Each dog wears its own life jacket! The dogs show the scientists where the whales are. Do you think your dog could be trained to track a whale?
During the winter very large baleen whales, called RIGHT whales, visit the Northeast Florida coast. These whales arrive in December and leave in March or April.

1. Why are these animals called “Right” Whales?

2. Why do they visit Florida waters each winter?
3. Fill in the parts of this whale

4. Look carefully at the right whale above. Is this whale a baleen whale or an odontocete?

5. Right whales feed by swimming at the surface with their mouth open.

This is called _ K _  M M _ _ G. (Fill in the blanks.)
6. Let’s compare right whales and humpback whales. Here is a list of terms that go with right whales, humpback whales or both. Write each term in the proper place in the Venn diagram.

Skim Feeder  Short triangular flippers
Gulper        Callosities
Baleen        Flukes
Long white flippers  Sings

Right Whales  Humpback Whales
7. Right whales eat by skimming the surface of the ocean. Which of the following do you think they eat? (circle your answer).

- Sharks
- Fish
- Plankton
During the winter very large baleen whales, called RIGHT whales, visit the Northeast Florida coast. These whales arrive in December and leave in March or April.

1. **Why are these animals called “Right” Whales?**
   
   *They are slow swimmers. They are found close to shore. They floated when killed. All of these made them the “right” whale to hunt.*

2. **Why do they visit Florida waters each winter?**
   
   *To have their calves/babies*
3. Fill in the parts of this whale

- Tail fluke
- Eye
- Flipper
- Baleen

4. Look carefully at the right whale above. Is this whale a baleen whale or an odontocete?
   *Baleen whale (or mysticete)*

5. Right whales feed by swimming at the surface with their mouth open.
   
   This is called **S K I M M I N G.** (*Fill in the blanks.*)

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
6. Let’s compare right whales and humpback whales.
Here is a list of terms that go with right whales, humpback whales or both. Write each term in the proper place in the Venn diagram.

- Skim Feeder
- Gulper
- Baleen
- Long white flippers

<table>
<thead>
<tr>
<th>Right Whales</th>
<th>Humpback Whales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skim Feeder</td>
<td>Short triangular flippers</td>
</tr>
<tr>
<td>Gulper</td>
<td>Callosities</td>
</tr>
<tr>
<td>Baleen</td>
<td>Flukes</td>
</tr>
<tr>
<td>Long white flippers</td>
<td>Sings</td>
</tr>
</tbody>
</table>

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
7. Right whales eat by skimming the surface of the ocean. Which of the following do you think they eat? (circle your answer).

- Sharks
- Fish
- Plankton
Lesson 12: Identifying individual North Atlantic right whales

Objective: Students will learn about the New England Aquarium's right whale database and will try to match photographs of individual right whales.

What you will need:

- Ability to project PowerPoint Presentation
- Downloaded Lesson 12 PowerPoint
- Downloaded Right Whale Matching Game PowerPoint (if no internet access)
- Copies of Right Whale Identification Data Sheets (pages 12-4 and 12-5)—one or more per student
- Internet access (optional)
- Laptops or other wireless devices (optional)

Sunshine State Standard: SC.4.N.1.6

Vocabulary: New England Aquarium, catalog/database, callosities, cyamids, “whale lice”

Strategy:

1. Use the script below in conjunction with the PowerPoint presentation to teach students about identifying individual North Atlantic right whales. This presentation contains background information on the New England Aquarium, North Atlantic right whale catalog and database, and right whale identifying methods.

Slide 1. Today we are going to learn more about how scientists identify individual North Atlantic right whales.

Slide 2. As you may recall from earlier lessons, researchers use small airplanes to spot and photograph right whales. They may also take photographs from land using cameras with very powerful zoom lenses.

Slide 3. The photographs are all sent to the New England Aquarium, where they are added to the North Atlantic right whale catalog. This collection of photographs is viewable online at the New England Aquarium’s website.

Slide 4. Scientists study the photographs very carefully and try to figure out if the whale in the picture is one that they already have in the catalog, or if it is a “new” whale (one that has not previously been reported.) If it is a new whale, they will assign it a number and will add it to the catalog. This helps scientists and managers know how many right whales remain.

Slide 5. Sometimes, scars and color patterns can be used to identify individual right whales. However, most right whales are identified by the “callosity pattern,” which is as individual as our fingerprints.

Slide 6. “Callosities” are places where the skin on the head is thickened and forms big bumps. Each pattern is unique to only one whale. The skin itself is dark, but small white shrimp-like animals called “cyamids” or “whale lice” move into these areas. The cyamids make...
the callosities look white, which allows right whales to be identified from their photographs.

Slide 7. There are several different locations on the whale where callosities can be found. They are mostly on the head. Scientists look for callosities that they describe as the “Bonnet” (on the top of the rostrum, or front part of the head), the chin, the lips, the “coaming” (which is the area right in front of the blowhole), the area just behind the blowhole and the area over the eye.

Slide 8. Here we can see each of the different types of callosities. Remember that the shapes and sizes of the callosities will be different from whale to whale. Also, not every whale has all of the different types of callosities.

Slide 9. When we look at the bonnet and coaming, sometimes they are joined together, and sometimes they are separate. When they are joined together, scientists call this “continuous”. When they are separate, we call the callosity pattern “broken.” Which of these two whales has a continuous callosity pattern? [Answer: the one on the right. Note that the whale in the picture on the left looks a little different because it is swimming with its mouth open—probably feeding!]

Slide 10. Whales that have continuous callosities on the head may have “peninsulas” within the callosities—these are small, round callosities that look like bulges in the peninsula. Whales with a broken callosity pattern often also have these round callosities, but we call them islands, because they are not attached to a larger callosity. [Point out the peninsulas and islands on the whales in the two pictures.]

Slide 11. Sometimes whales have scars on their bodies. These scars look white. Scars usually come from ship strikes or from entanglement in rope or other fishing gear. Researchers can sometimes use scars to help identify individual right whales. The scars on the whale in this picture were made by the propeller of a boat. [Point out the parallel white lines on the whale on the left side of the photo.]

Slide 12. Some right whales have unique color patterns that help scientists identify them. This whale has a mostly white belly. Some right whales have bellies that are completely black. If scientists can get a good look at the belly, they can sometimes use the pattern there to help identify the whale.

Slide 13. Researchers take the photographs of each right whale and draw the outline of all callosities and scars seen on that whale on a data sheet. This data sheet becomes part of the right whale catalog and will be used to try and identify the individual whales from future photographs. Researchers need to be careful to find and record all of the identifying marks. Sometimes a photograph will only show a small part of the whale’s body, so creating a complete picture can be challenging!

Slide 14. I am going to show you some pictures of a whale called Pediddle. She is one of the hundreds of North Atlantic right whales that have been identified by scientists.

Slide 15. Remembering what we have just learned about callosities, let’s try and identify the different types of callosities that we can see on Pediddle. [As you click on the slide, the six different types of callosities will be highlighted—read the name of each one in turn.]

Slide 16. Here we see all of the different callosities circled.
Slide 17. Now it’s your turn. On your right whale identification data sheet, try and draw all of the callosities and any scars that you might see in this photograph. Some of the white marks that we see where the water touches the whale’s back are actually glare from the sunlight reflecting off the water. Sometimes the whale’s skin will be shedding, leaving grey marks on the animal that will turn black later. It is helpful to have several photos of the same whale to make sure that all of the scars and callosities are correctly recorded!

[Give the students several minutes to make their sketches.]

Slide 18. Compare your drawing to the one that the researchers have in the catalog. How did you do? What marks did you get right? Which ones were you missing?

Activity—Right whale identification/matching game:
There are two options for this activity. It might be helpful for students to have blank copies of the right whale identification sheet (page 12-4 and 12-5) to use to sketch the whales’ callosities and scar patterns during this activity.

1. If you have internet access in the classroom, you can either project this website, or have students access the site on individual computers/devices. This is a right whale identification (matching) game created by the New England Aquarium: [http://www.neaq.org/education_and_activities/games_and_activities/online_games/right_whale_identification_games.php](http://www.neaq.org/education_and_activities/games_and_activities/online_games/right_whale_identification_games.php). Encourage students to use additional right whale ID data sheets to sketch each of the whales when trying to decide the identity of the “unknown” whale.

2. If you do not have internet access, or if you want a slightly easier version of the game, download the “Lesson 12-right whale matching game” PowerPoint presentation and show it to the students. Encourage students to use additional right whale ID data sheets to sketch each of the whales when trying to decide the identity of the “unknown” whale. This version of the game is based on the online one by the New England Aquarium. All photos used in the game are used with permission of the photographers (see the last slide in the PowerPoint for more information).

   a. Read the instructions on the first few slides.

   b. Correct answers are (easy round) 1152; second round: 1950 and third round: 1701.

This activity is available online at [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
Right Whale Identification Data Sheet

Observer (student) Name: _______________________

Whale Name or Number: ________________

Instructions:
Look at the photographs of your whale (write the number above) and try to draw the callosities and scars that you can see in the pictures. This will help you identify your whale.

This is a view of the top of the head of the whale. This is what you would see if you were looking down on the whale from an airplane or a boat.
Left Side View:

If you have a view of the left side of your whale’s head, try to draw the callosities and scars on this diagram.

Right Side View:

If you have a view of the right side of your whale’s head, try to draw the callosities and scars on this diagram.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Lesson 13: North Atlantic right whale migration

Objective: Students will learn about the migration path of North Atlantic right whales and how researchers are studying the movement of these whales.

You will need:

- Ability to project PowerPoint presentation
- Copy of PowerPoint presentation, “Right whale migration.”
- Internet access (to access sound clips used in PowerPoint presentation)
- Worksheets (page 13-5; 1 per student)
- Optional: copies of Incredible Journey worksheet for each student (Whales: Activities Based on Research from the Center for Coastal Studies pg. 38)

Sunshine State Standards: SC.4.E.6.5; SC.4.P.12.2

Vocabulary: migration, sedative, hormones, calves, satellite tag, acoustic buoy, juvenile

Strategy:

1. Use the script below in conjunction with the PowerPoint presentation to teach students about North Atlantic right whale migration.

Slide 1. Today we are going to learn about North Atlantic right whale migration.

Slide 2. What does “migration” mean? Many animals spend part of the year in one location, but then move to another place for part of the year—often to look for food, or to breed. This movement is called migration. Can anyone name an animal that migrates? [Answers include many insects, especially monarch butterflies, many birds, fish and whales] Why do you think right whales migrate? [Write the students’ suggestions on the board. If students don’t have any ideas, prompt them to think about what whales might need in order to survive, and how that might affect where the whales go. Ideas could be to follow food, to look for warmer or colder water, to look for mates etc. Some students might know that right whales come to the Georgia/Florida area in the winter to have their babies.]

Slide 3. This map shows the western Atlantic Ocean and the east coast of North America. [You may want to point out your location on the map]. In the spring—late February through April—most of the North Atlantic right whales can be found off the coast of New England, especially in the area of Cape Cod Bay, Massachusetts [As you mention each one, indicate the areas on the map]. By May, most of the whales gather in an area just southeast of Cape Cod, where there are large patches of copepods, the plankton that right whales like to eat. In summer and early fall, many of the right whales move into the Bay of Fundy, or swim to waters off Nova Scotia where they feed. In the winter, pregnant female whales, accompanied by some juvenile whales and a few other adult whales, migrate about 1,400 miles south to the warmer waters off Georgia and northern Florida. The females will give birth to their babies, called calves, between about
December and March. The whales do not feed much in this region because there is not a lot of plankton there for them to eat.

Slide 4. Why do you think the pregnant whales come to Florida to have their calves? [As a hint, ask them what is different about Florida compared to Massachusetts in the winter. E.g. the water is warmer; baby whales may be less stressed if they are born in warmer water. On the opposite side, there is less food for the moms, so they need to feed really well before they head south as they will be nursing their calf for a couple of months without being able to eat very much. Studies have shown that pregnant female right whales have thicker blubber than non-pregnant whales; that blubber apparently provides the nutrients needed for milk production.]

Slide 5. Where the rest of the adult whales go in the winter is a bit of a mystery, but they probably are going somewhere where there is lots of food. Recently, researchers have discovered that some of the whales may stay in the Gulf of Maine through the winter months. Also, there may be another calving area somewhere. It is difficult to learn where the other whales are because it is a very large ocean, and whales can only be spotted from the air when they are near the surface of the water, so it would not be realistic to try and make survey flights covering the entire North Atlantic Ocean year-round. Scientists believe that right whales should mate in the winter, as we think that their pregnancies last for about 13 months. There should be mating areas somewhere...presumably that is where some of the whales go in the winter. Scientists are using whale poop to learn more about this—they can measure compounds called hormones in the poop samples and can tell if the whale is a male or female, and also if it is a female that is ready to become pregnant. How do the find the whale poop? They are using specially trained dogs that can smell the poop and signal the scientists where to look!

Slide 6. By late March, the whales that traveled to southern waters are migrating back north to the feeding grounds near Cape Cod.

Slide 7. We know quite a bit about the whales that come to the southeastern U.S. coast because various agencies and groups make surveys to locate and identify the individual whales. Here you can see pictures of some of the different types of airplanes that are used to look for the whales.

Slide 8. Observers in the airplanes and onshore use binoculars to locate right whales, then try to get good photographs of the whales so they can be identified.

Slide 9. Scientists are using technology to try and learn more about right whale migrations. Satellite tags are attached to the back of a whale using suction cups. When the whale comes to the surface to breathe, and the tag sticks out of the water, it sends a signal into space where the signal is picked up by a satellite. The satellite can tell where the signal came from, and can transmit that information to a computer down on Earth. This allows scientists to plot the whale’s location on a map.

Slide 10. This map shows the path of a right whale that was tracked off the coast of Florida for about a week in January, 2011. The whale had been tangled up in rope. Scientists were able to remove the rope, but they had to use sedatives on the whale. Sedatives are medicines that make the whale calm so it doesn’t swim away from the people who are
trying to help it. The researchers attached a small satellite tag to the whale’s skin so they could monitor the whale and make sure it didn’t have any side effects from the sedatives. These tags do not stay attached to the right whales for more than a few days.

Slide 11. Acoustic buoys—basically underwater microphones that record noises in the ocean—have been used in areas around Cape Cod to study whale movement. The devices record whale calls along with the date and time that the whale made the sounds. The data can be collected and analyzed by scientists to help them learn how the whales are moving around. The yellow ball-like device in the middle of this picture is an acoustic buoy. The researchers are getting ready to set it in place on the sea floor.

Slide 12. So what is it that the researchers are listening for? On this website [click on the link to navigate to the site], we can hear some of the different types of calls that right whales make. [one at a time, click on the wavelength icons to the left of the right whale photograph. Make sure that your volume is turned up! A description of each sound will appear to the right of the screen.]

Slide 13. Let’s review what we know about North Atlantic right whale migration.
- Where are most of the North Atlantic right whales found in the spring, summer and fall? [In waters from Cape Cod, MA to Nova Scotia, Canada—the yellow area on the map.]
- Why are they here? [There is a lot of plankton here for the whales to eat.]
- Where do pregnant female North Atlantic right whales migrate to in the winter? [To waters off southern Georgia and northeastern Florida—shown in orange.]
- Why? [To have their calves.]
- How long do the moms and calves stay in the warm water? [They will be there from about December through March or early April.]
- Where do the other whales go in the winter? [Some juvenile whales and adult females will also spend part of the winter in the warmer southern waters. We still do not know where all of the other right whales go in the winter, but new research suggests that some of them may stay in their spring and summer feeding area year-round.]

2. Give students copies of right whale migration worksheet to complete.

Additional resources (for teachers):

About where North Atlantic right whales are in the winter:

http://www.workingwaterfront.com/columns/Right-whales-spending-winter-in-the-Gulf-of-
Maine/14272/


maine_in_winter/

About acoustic buoys:

www.nefsc.noaa.gov/press_release/2006/nr0601.htm

http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19961/MellingerEtAl-
RightWhalesRediscovered.pdf?sequence=4

http://onlinelibrary.wiley.com/doi/10.1111/j.1748-
7692.2010.00376.x/abstract?systemMessage=Wiley+Online+Library+will+be+disrupted+17+
March+from+10-14+GMT+%2806-
10+EDT%29+for+essential+maintenance&userIsAuthenticated=false&deniedAccessCustomisedMessage=
North Atlantic right whale migration worksheet

Read the paragraph and answer the questions below.

Right whale # 1408 was spotted on December 10, 2007 off the coast of Georgia. The same whale was observed several times in January and February 2008 off the coast of northern Florida and Georgia. It was spotted off Georgia on March 1, 2008, then was next seen in May in the Great South Channel (southeast of Cape Cod, Massachusetts).

1. Do you think whale # 1408 is a male or a female? What evidence in the paragraph supports your guess?

__________________________________________________________________________________________

__________________________________________________________________________________________

2. Whale # 1611 was spotted on March 2 in Florida and then again on April 30 in the Gulf of Maine. The whale swam about 1,400 miles.

a. How many days did it take the whale to swim 1,400 miles? ____________

b. How many weeks is this? (your answer to part a ÷ 7)

c. Assuming the whale swam constantly without stopping, how many miles did it swim every week? (1400 ÷ your answer to part b)

d. How many miles did the whale swim each day? (answer to part c ÷ 7)
ANSWER KEY

North Atlantic right whale migration worksheet

Read the paragraph and answer the questions below.

Right whale # 1408 was spotted on December 10, 2007 off the coast of Georgia. The same whale was observed several times in January and February 2008 off the coast of northern Florida and Georgia. It was spotted off Georgia on March 1, 2008, then was next seen in May in the Great South Channel (southeast of Cape Cod, Massachusetts).

1. Do you think whale # 1408 is a male or a female? What evidence in the paragraph supports your guess?

Female—she spent January to March off Florida and Georgia where she probably had a calf.

2. Whale # 1611 was spotted on March 2 in Florida and then again on April 30 in the Gulf of Maine. The distance between the two locations is about 1,400 miles.

   a. How many days did it take the whale to swim 1,400 miles? __59 days____
   
   b. How many weeks is this? (your answer to part a ÷ 7)

   59 ÷ 7 = 8 (remainder 3)

   c. Assuming the whale swam constantly without stopping, how many miles did it swim every week? (1400 ÷ your answer to part b)

   1400 ÷ 8 = 175 miles per week

   d. How many miles did the whale swim each day? (answer to part c ÷ 7)

   175 ÷ 7 = 25 miles per day
Lesson 14: Why have right whales been hunted?

Objective: Students will learn about historical whaling activity, which decimated the population of North Atlantic right whales.

You will need:

- Copies of North Atlantic Right Whales—the “right whale” to hunt and The Last North Atlantic Right Whale Hunt for each student (pages 14-4 and 14-5)
- Copies of The Great Right Whale Hunt (instructions; page 14-3) for each student
- Optional: Copies of grading rubric (page 14-2) for students
- Writing paper
- Pens or pencils
- (Optional) Computers with internet access

Sunshine State Standards: SC.4.L.17.2; SC.4.L.17.4

Strategy:

1. Give students copies of the two right whale hunting articles. Have them read both articles.
2. Give students copies of The Great Right Whale Hunt instructions.
3. Explain that they are to write a journal/diary entry pretending to be either a whaler from the 1500's OR one of the fishermen in 1935 that killed the right whale calf. (You might want to share the grading rubric so students can see what you will be looking for in their writing). Remind students that they should be writing in the first person, in the role of the character they have chosen.
4. Point out that there are several suggested questions for them to answer in their writing. They should include factual information from the article(s) in their journal entry, but they are free to make up other details to add to their story.
5. Optional: Have students type up their journal entry on the computer and have them search for images on the internet to use to illustrate their story.
6. Optional: Have students read their journal entry aloud to either the entire class, or in small groups.

References:

- Resources used in compiling articles:
  - [http://www.neaq.org/conservation_and_research/projects/endangered_species_habitats/right_whale_research/right_whale_background/last_whale_hunt.php](http://www.neaq.org/conservation_and_research/projects/endangered_species_habitats/right_whale_research/right_whale_background/last_whale_hunt.php)

This activity is available online at [http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html](http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html)
# Rubric for Simulated Journal Entry for Fourth Graders

Name of student ____________________________________________________________

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. of Sentences</strong></td>
<td>At least 12</td>
<td>At least 8</td>
<td>At least 5</td>
<td>No attempt</td>
</tr>
<tr>
<td><strong>Conformed to journal type</strong></td>
<td>Conforms to simulated journal throughout, using first person.</td>
<td>Usually conforms to simulated journal. Sometimes uses third or second person, changing to a learning log.</td>
<td>Author rarely conforms to simulated journal. Often uses third or second person, changing to a learning log.</td>
<td>No attempt</td>
</tr>
<tr>
<td><strong>Stayed on topic</strong></td>
<td>Always stayed on topic, writing about the one event.</td>
<td>Usually stayed on topic, but sometimes wrote about multiple events.</td>
<td>Rarely stayed on topic. Wrote about multiple events that were unrelated.</td>
<td>No attempt</td>
</tr>
<tr>
<td><strong>Maintained character</strong></td>
<td>Always wrote as the character. Gave only factual information that the character would know.</td>
<td>Sometimes wrote as the character. Sometimes gave factual information that the character would not know.</td>
<td>Seldom wrote as the character. Usually gave factual information that the character would not know.</td>
<td>No attempt</td>
</tr>
<tr>
<td><strong>Utilized information from assigned readings</strong></td>
<td>Included at least 3 pieces of information gleaned from assigned readings.</td>
<td>Included 2 pieces of information gleaned from assigned readings.</td>
<td>Included 1 piece of information gleaned from assigned readings.</td>
<td>Did not include any information from the assigned readings.</td>
</tr>
<tr>
<td><strong>Word choice and sentence structure</strong></td>
<td>Vivid language. Varied, correct sentences.</td>
<td>Interesting words and vocabulary, simple sentence structure</td>
<td>Uses simple words and simple sentence structure.</td>
<td>Limited word choice, weak sentence structure.</td>
</tr>
<tr>
<td><strong>Grammar, usage and spelling</strong></td>
<td>Excellent use of mechanics, capitals, spelling.</td>
<td>Use of correct mechanics, capitals and spelling usually demonstrated.</td>
<td>Some use of correct mechanics, capitals and spelling, but with errors.</td>
<td>Errors impede communication</td>
</tr>
<tr>
<td><strong>Total points</strong></td>
<td>3 x ____ = ____ pts</td>
<td>2 x ____ = ____ pts</td>
<td>1 x ____ = ____ pts</td>
<td>0 x ____ = ____ pts</td>
</tr>
</tbody>
</table>

Total points for Simulated Journal Entry = ____________
The Great Right Whale Hunt

Instructions:

1. Read North Atlantic Right Whales—the “right whale” to hunt and The Last North Atlantic Right Whale Hunt.
2. Write a short story using information from the articles. You should pretend that you are one of the following people:
   a. A whaler in the 1500's
      OR
   b. One of the fishermen who killed the baby right whale in 1935
3. Your story should be like a diary entry (describing one entire day). You can make up some of the details, but should also include factual information from the article(s) in your story. You can also include facts that you know about right whales in your story.
4. Here are some questions to try and answer in your story:
   a. Who are you? How old are you? Where do you live?
   b. What did you do that day? Include what you saw, smelled, felt etc.
   c. How did you feel about the things you did that day?
   d. Why were you doing what you did?
   e. Who else was with you?
5. (Optional). Type your diary entry in a word processing program on the computer. Find pictures from the internet to add to your story.
North Atlantic Right Whales—the “right whale” to hunt

North Atlantic right whales were hunted at least 1000 years ago off Spain and France. At that time, the whales were found throughout the North Atlantic Ocean. In the 1500’s and 1600’s, there were not many right whales left in the eastern Atlantic. Whalers then moved to areas off Newfoundland and Labrador to hunt for bowhead and right whales. In the early days, people hunted whales from small boats, using harpoons. A harpoon is a long spear with a rope or chain attached to it. The whalers would throw the harpoon into the whale. This would allow them to pull the boat alongside the whale and they could then kill the whale.

Why did people hunt right whales? Right whales are slow-moving, they like to stay close to shore and hang out near the ocean’s surface. They have thick blubber, which makes them float when they are killed. Blubber is one of the things that whalers wanted from the whales. They would turn the blubber into oil that could be used in lamps. Apparently right whale oil did not smell very good!
In addition to blubber, people wanted the baleen from the whales’ mouths. They used baleen for many things that we make from plastic or metal today. Umbrella ribs, horsewhips and stiffeners for ladies’ clothes were all made from baleen. Baleen is sometimes called “whalebone.” People would also eat right whale meat.

The Last North Atlantic Right Whale Hunt

In January of 1935, a female right whale and her calf were swimming along the Florida coast. They were spotted by a group of fishermen from the shore. The men got a small boat into the water and chased the whales. They managed to harpoon the calf and shot both the mother and the calf with a rifle. The hunt lasted for more than six hours, during which time the mother stayed by the calf’s side. Eventually, the one or two-month-old calf died and the mother swam away. The calf was the last right whale hunted in U.S. waters. Right whales became protected later that year.
Lesson 15: How do right whales communicate?

Objective: Students will learn how baleen whales use sound to communicate, and how human-created noise in the ocean may affect their ability to do so. Students will conduct an activity to simulate whale communication and interference by human noises.

You will need:

- Computer with internet connection and speakers
- Ability to project what’s on the computer (projector or smartboard)
- Masking tape or painter’s tape
- Markers
- Music CD or other source of music
- Paper circles (or any shape) about 6” in diameter—you will need 5 different colors; three cut-outs of each color.
- Index cards or pieces of paper (1 for each person in the class). Label the cards as follows:
  - 5 cards for Whale 1 through 5 (Whale 1, Whale 2, Whale 3, Whale 4 and Whale 5)
  - 5 cards for Tracker 1 through Tracker 5
  - Label the remaining cards Sound Receiver 1 through Sound Receiver # (one for each remaining student).

Sunshine State Standards: SC.4.L.17.4. (Optional Activity 2 addresses SC.4.P.10.3)

Vocabulary:

- Sound = repeated vibrations that animals can hear
- Amplitude = the measure of a sound wave
- Echo = a reflection of sound
- Pitch = how high or low a sound is; determined by the frequency of the vibration
- Sonic Boom = a shock wave that consists of compressed sound waves created when something moves faster than the speed of sound
- Sound Wave = sound travels in a wave, which is a moving pattern of high and low pressure or vibrations
- Speed of Sound = how fast sound moves through an object
- Vibrate = to move back and forth
- Volume = how much sound energy reaches the ear
- Wavelength = the length between the compressions in a sound wave

Strategy:

1. Before class starts, open the websites listed in #8, #9 and #11 below. Make sure your computer’s sound is turned up.
2. Also before class, use masking or painter’s tape to mark out a grid on the floor. Horizontal and vertical lines should be about 2’ apart. Ideally, you want to mark out an area that is about 20’ x 20’ (eleven horizontal and eleven vertical lines). Use a marker to write the

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
numbers 1-10, one in each square at the top or bottom of the grid (on the vertical lines) and the letters a-j on the leftmost or rightmost of the horizontal lines (see picture on page 15-4). If you have access to a floor area that consists of square flooring tiles, you can simply use pieces of paper with the numbers and letters on them lined up with existing rows and columns.

3. Start off by asking students how they communicate with each other and with their family and friends. [Answers might include by texting, by talking, by writing notes, by drawing pictures, by making faces, etc.]

4. Ask students to imagine that they are right whales, living underwater, in the huge North Atlantic Ocean.

5. How do the students think right whales can communicate with each other? [Sound. If students have completed lesson 7, they should already be familiar with the fact that sound waves can travel through water...]

6. Explain that you will be playing a game to see how well the students can listen. Inform the class that they will not be graded on how many answers they get right or wrong, but how well they participate in the activity. Explain that everyone will be told to close their eyes and that everyone will need to be very quiet. You will walk around the room and touch one student on the shoulder. That student will say (in their normal voice) the words "I am a right whale." [write these words on the board as you explain this step]. Explain that the student can open his or her eyes to read the words off the board if they need to. When you say "OK," all students will open their eyes and write the name of the student that they think spoke the words on a sheet of paper. You will repeat this 4 or 5 times, remembering to keep track of which students spoke each time. Once you have done this using several students in different parts of the room, review the correct answers with the class. How did they do? Ask the students how they knew who it was who was speaking [they should have recognized the person’s voice.]

7. Explain that whales and dolphins have different voices, but that they also use different types of calls to communicate in different ways.

8. Explain that you will be playing some right whale sounds. The students will need to be quiet, as some of the sounds are difficult to hear. Make sure your speaker volume is turned up. Go to http://www.listenforwhales.org/page.aspx?pid=432 and click on the different right whale calls there. You may need to play them more than once for the students to hear them. Click on the “other whale sounds” link at the bottom of the page to get to three more types of right whale calls. Play each of these.

9. Go to http://www.voicesinthesea.org and select “Species,” “Baleen Whales”, then “blue whale”. Move your mouse over to “Blue whale videos” in the upper right portion of the screen and three options will appear. Click on the middle video (The Voice of the Blue Whale). [This is about a 1-minute video clip.]

10. Ask the students what challenges they can think of to communicating by sound in the ocean? If students cannot come up with any ideas, prompt them by asking if whales are the only things that make noise in the ocean. [The answer should be “no”—there are lots of other natural noises in the ocean, from fish to shrimp to underwater volcanoes, but there

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
are also lots of human-made noises in the ocean. So... one of the main challenges for whales is being able to hear whale calls over all of the other sounds in the ocean.

11. Explain to the students that they are going to listen to a recording made underwater in Massachusetts Bay, which is the area where right whales feed in the spring and summer. Go to http://www.listenforwhales.org/page.aspx?pid=441 and click on the link “Listen to ship noise in Massachusetts Bay.” (You may want to have students close their eyes while they listen.)

12. Remind the students how short in duration and relatively quiet the right whale calls were. Ask the students if they think they could hear a right whale with all the ship noise going on.

13. Explain that researchers use underwater microphones to try to locate right whales in Massachusetts Bay. The www.listenforwhales.org website has a map showing where these microphones are, and whether or not they have detected a right whale call in the past 24 hours. Explain that the class is going to do an activity to mimic tracking whales in the ocean using whale sounds.

14. Hand out nametags to the students. Five students should get nametags that say “Whale 1” through “Whale 5”; five should get “Tracker 1” through “Tracker 5” nametags and the rest should get “Sound receiver#” tags. If necessary, push back the chairs and desks/tables to clear the area that is marked off as a grid.

15. Give each tracker three cut-out paper circles (use a different color for each tracker) and a marker.

16. Position the Sound receivers throughout the grid (you may choose to arrange them in a pattern, or simply place them randomly.

17. Explain that each whale is going to communicate by saying their number. So, Whale 1 will say “one, one, one...” etc. The five whales will be moving around the ‘ocean’ that is marked off by the tape, and will be calling quietly as they go.

18. The receivers are going to close their eyes and are going to listen for the whales. When they hear one of the whales well enough to know which whale it is, they should point to that whale with one hand and raise their other hand with the proper number of fingers (one finger for Whale 1, two for Whale 2, etc.). If three receivers are pointing to the same whale, that whale’s tracker should call out “stop.” All of the whales should stop moving and should be quiet. The tracker will then write down the numbers of the trackers that “heard” the whale on a circle, and will tape the circle to the floor where the whale was “located”.

19. Once the tracker has the position recorded, remind the receivers to make sure their eyes are closed, and have the whales start moving and calling their number again. Repeat until all whales have been “located” twice. Once a whale has been “located” twice, that whale and its tracker can sit down (outside the “ocean”) and just observe.

20. Explain that the class will repeat this game but that there will be some “ship noise” added in. Warn the whales that they should not increase their volume. Repeat steps 14-19, but after a few minutes, start to play music (gradually increase the volume to represent the ship traveling very close to the receivers). The receivers will probably not be able to hear the whales any more. You can stop the game at any point after this.

21. Ask the receivers what happened once the music started? Was it more difficult for them to detect the whales? Ask the whales if they could hear each other. Ask the students if they
think that ship noise might make it harder for whales to communicate with each other [Yes!].

22. Summarize the day’s lesson—Ask the students how whales communicate with each other (by sound) and what types of human activities might interfere with whales’ abilities to hear each other (ships, airplanes, explosions, drilling, etc…). Why might this be bad for whales? [In other words, if whales cannot communicate with each other, what might happen?—many possible answers including mothers and calves may become separated/lost, whales won’t be able to warn each other about dangers, whales won’t be able to tell each other where good food is, whales won’t be able to find each other to mate, etc…).

Optional Activities:

1. This can be done by individual students or small groups if several computers are available or by the class as a group if the website can be projected. Go to www.voicesinthesea.org and click on “Games,” then “Call matching.” There are other great things to do on this website as well 😊

2. (This requires students to have access to computers with sound...but internal speakers on a laptop are sufficient. Headphones would be ideal, but not required.) Have students go to: http://www.engineeringinteract.org/resources/oceanodyssey.htm. This is a great online game for the students to play—it teaches them about frequency, pitch and volume. Allow the students at least 30 minutes to complete. Once the students have successfully freed the princess/mermaid, they are done (the website gives an option to continue, which you can allow students to do. If they do continue, they will learn more information about sound, but it may take more time than is available).

3. A printable student worksheet on sound (and transmission of sound through different materials) can be found at: http://www.gscdn.org/library/cms/11/14411.pdf

References:

- Activities above are modified from Pod Squad (http://cetus.ucsd.edu/voicesinthesea_org/Flash) and On the Trail of a Whale (http://www.dosits.org/files/dosits/Trail%20of%20Whale.pdf).
Template for layout of tape and numbering/lettering for the grid used with whale detection activity:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Lesson 16: North Atlantic right whales and ship strikes

Objective: Students will learn why ship strikes are a threat to North Atlantic right whale survival, and what conservation measures are in place to reduce this threat.

You will need:

- Ability to project PowerPoint presentation
- Copy of PowerPoint presentation, “Slow Down, Whale Crossing.”
- Speakers
- For the activity:
  - An area (like a hallway or outside lawn) that is around 10ft wide and 30ft long: this is the designated “shipping lane”
  - Optional: flagging tape or painter’s tape to mark off “shipping lane” area
  - Materials to make id tags or costumes for students playing “right whales” (about ¼ of the students)
  - Materials to make id tags or costumes for students playing “ships”
  - Baseball cap, hat, or visor to wear for students playing the “ship’s captain” (optional)
  - Materials to mark the edges of the “shipping lane”, including a starting line and a destination port at the far end of the marked area (examples: sidewalk chalk, paint, crayons, string, cones, colored tape)
  - Writing utensils for “right whale” students
  - Copies of the “Ship Strike Tally Sheet” (page 16-7; one for each “right whale” student)

Sunshine State Standards: SC.4.E.6.5; SC.4.L.17.4

Vocabulary: Ship strike, Shipping port, Shipping lane, Mariner, Aerial survey, Knot, Nautical mile

Strategy: There is an instructional PowerPoint presentation and an (optional) activity that reinforces concepts introduced in the presentation.

Presentation: Slow down…whale crossing (PowerPoint)

Teacher Script

Slide 1. This presentation contains background information on North Atlantic right whales and ship strikes; and the conservation methods put into place in order to decrease right whale deaths due to ship strikes.

Slide 2. [Read slide] Why do you think there are so few North Atlantic right whales in the ocean today compared to years ago? [Write student responses on the board. Hunting, entanglement and ship strikes are all good answers.]

Slide 3. In this lesson, we are going to focus on the threat of ships and boats (also called vessels) hitting whales.

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Slide 4. [Read slide] Vessel strikes are one of the greatest human-caused threats to North Atlantic right whales. Whales can be killed if they are cut by propellers and also from the force of being hit by the vessel.

Slide 5. The ocean is very large, and there are not very many right whales. So why do so many of these whales get hit by boats?

Slide 6. North Atlantic right whales are vulnerable to being hit by vessels because of where they live and migrate (their habitat), their appearance (in other words, what the whales look like), and their behavior. We will discuss each of these separately.

Slide 7. As we have learned in other lessons, North Atlantic right whales migrate along the east coast of the U.S. from their northern feeding and mating ground to the southern calving area. Right whales are often found within 20 miles of shore. Many ships and boats pass through this area as they come into port or move offshore.

Slide 8. Shipping ports are places where ships and boats can dock to load and unload what they are carrying. The southeastern US is home to some of the biggest shipping ports in the world. Many shipping ports, like Boston, Massachusetts and Jacksonville, Florida are near areas where right whales spend a lot of time.

Slide 9. Even though we do not have roads in the ocean, ships often use specific routes to travel from one place to another—we call these routes “shipping lanes.” Ships use shipping lanes because they have deep enough water, the currents go in the right direction, and so on. Many shipping lanes are located in the North Atlantic right whale habitat.

Slide 10. Large ships are not the only type of vessel that can hurt right whales. Whales can even be killed if they are hit by a small recreational boat.

Slide 11. Why does the right whale’s appearance make it likely to be hit by a ship? Mariners (people in charge of sea-going vessels) have a hard time seeing the whales in the water because they are dark in color, and they don’t have a dorsal fin to stick out of the water.

Slide 12. How does a right whale’s behavior make it likely to be hit by a ship? Right whales tend to stay near the surface of the ocean, and they usually only have a very small portion of their head (and sometimes back) sticking out of the water when they breathe.

Slide 13. Like other marine mammals, whales do not know that boats can be dangerous to them. Have any of you ever seen a wild animal crossing a road? These animals often do not realize that cars can hurt them. Even if a whale did know that a ship was dangerous, ships are often traveling faster than the whales, so it would be difficult for the whale to get out of the way fast enough.

Slide 14. [Read slide]

Slide 15. There are many conservation efforts to help protect North Atlantic right whales. These include the Early Warning System, laws and regulations such as the Ship Strike Reduction Rule and No Approach Rule, as well as extensive education and outreach for mariners and boaters. We are going to talk more about each of these.

Slide 16. To try and help protect North Atlantic right whales, a program called "The Early Warning System" was started in 1993. The Early Warning System relies on planes flying over the North Atlantic right whale’s critical habitat areas to perform aerial surveys. These surveys are done in the calving area in winter months and in the feeding grounds at other times of the year. People in the planes act as “spotters” and use binoculars to
look for whales in the water below. If an aerial surveyor spots a right whale, they relay the GPS location of the whale to everyone in the area who should know to look out for a whale. "Everyone in the area" includes commercial mariners, U.S. Navy, harbor pilots, Army Corps of Engineers, U.S. Coast Guard, port authorities, and recreational boaters. What this means to a ship captain is that if they receive a radio notice that there is a whale nearby, they have to assign a crew member to look for the whale. They also need to communicate with other ships in the area in case one of them spots the whale. This helps everyone figure out exactly where the whale is. The ships need to avoid the whale, and should not steer in a direction that would put the ship in front of the whale. The closer a ship is to a whale, the more it needs to slow down. This is so that if the ship accidentally does hit the whale, it hopefully will not hurt the whale badly.

Slide 17. In 2008, the Right Whale Ship Strike Reduction Rule was started. This rule requires ships that are more than 65 feet long (about 10 feet longer than a right whale!) to slow down to 10 knots (about 11.5 miles/hour) when in certain areas at certain times of the year.

Slide 18. In the next couple of slides, we will see where the right whale ship strike reduction rule is in effect. Off the northeast Florida and Georgia coasts, ships must go slowly during calving season. From November 1 through April 30, ships entering major ports along the east coast of the US between Georgia and Massachusetts must slow down because there could be migrating right whales present.

Slide 19. Off Boston and Cape Cod, right whales may feed year-round. If whales are present, ships must slow down no matter what time of year it is.

Slide 20. The No Approach Rule helps protect right whales from being disturbed by humans. This is especially important for mother whales that are pregnant or nursing newborn calves. The rule says we must not move towards or remain within 500 yards of a right whale....that's as long as 5 football fields. If a mother whale is scared by a vessel, kayaker, surfer, paddleboard, Jet Ski or even a swimmer, she may swim away and leave her calf. The baby right whale cannot survive without its mother. Also, if vessels keep 500 yards from right whales, this minimizes the chance that they will hit a whale.

Slide 21. Many groups try to teach people about right whales so that everyone can help protect them. We can all do our part to tell other people what we know.

Slide 22. We are going to watch two videos that were created to help teach people how they should behave around North Atlantic right whales. [Click on video clip to play it (video is 60 seconds long, and has narration, so you will want to have your sound turned on.)] What is the important message taught by this video? [Answer: People need to stay 500 yards away from right whales.]

Slide 23. Let's watch another video. [Click on video clip to play it (video is 630 seconds long)] What is the message of this one? [Answer: Boats need to slow down when whales are nearby.]

Slide 24. Why do we have all of these rules in place? We want to try and help the endangered North Atlantic right whale population continue to grow in size. In the last ten years or so, the estimated population of these whales has increased by about 100 or more individuals! You may have noticed that the videos we just watched said there were as
few as 400 North Atlantic right whales. They were made a few years ago. We now think there are at least 450 of these whales in the North Atlantic.

Activity "Slow Down...Whale Crossing!" Follow the activity directions below to have students demonstrate why ship strikes are a threat to right whale survival, and how the North Atlantic right whale recovery depends upon reducing ship strikes. Students should have heard and seen the accompanying PowerPoint presentation before starting this activity.

Set up:

- Find an area (approximately 10' x 30') to use as the “shipping lane.” Mark the edges of the shipping lane, the starting line, and a destination port at the end
- Divide students into groups of “ships” and “right whales”. Assign about ¼ of the class to be “right whales”. Assign the “ship” students to groups to represent different-sized ships (try groups of 1, 3 & 7). Each ship will have one student to represent the “ship's captain”. Use id tags or costumes to represent the different groups of whales and ships. (Optional) Use a hat to represent the captain of each ship.

Instructions to “ship” students: Have students line up in their “ship” groups. They should place their hands on the shoulders of the student in front of them and bend their elbow to get closer together. Have the students tilt their heads forward to look at their feet. The “ship's captains” should be located at the front of the ship. The “ship's captain” should put on a baseball cap, hat, or visor so while looking down at their feet they can only see a few feet in front of them. (Note: to achieve the same result students can shield their eyes as if wearing a visor). Explain that by letting the students see only what is right in front of them, they are simulating the fact that right whales are hard to see because their dark bodies blend in with the ocean and normally only a small part of their body shows above the surface.

The “ships” will start at the front edge of the “shipping lane” and try to move in straight lines towards a “destination port”. Explain that ships try to move in lines to their destinations as straight as possible because it saves time and fuel.

The “ships” may deviate from their path in order to avoid hitting a “right whale”. In order for a ship not to hit a whale the “ship's captain” must spot the whale and give the directions, “right whale spotted, turn left” (or right). “Ships” should try to steer behind the “right whales” whenever possible. “Ships” may slow down when turning to avoid a “right whale”; however, they may not stop and must speed back up to their original pace after their evasive maneuver. Single student “ships” should act the same as the students at the front of the larger ships, but they will not need to give verbal directions in order to perform an evasive maneuver.

Instructions to “right whale” students: The “right whale” students will crawl on the ground with the heels of their hands pressed against their knees or simulate another way for them to move slowly just like right whales. Ask them to space themselves out in the “shipping lane” and move around, stopping for periods to rest. Tell the students not to try to avoid being in the path of a “ship”, because it does not appear that right whales take evasive action to avoid being hit by oncoming
vessels (Note: to avoid student injury tell “right whale” students and “ship” students not to actually collide, just simulate the act). Give the “right whale” students the “Ship Strike Tally Sheet” and a writing utensil, and ask them to keep track of: 1.) How many times a “ship” hits them and what size the ship was 2.) How many times a “ship” narrowly missed them and what size the ship was.

Simulation 1: Business as Usual

Have your “ship” students make a run through the “seasonal management area” (aka the shipping lanes) while walking fast. “Right whale” students should make their tallies in the “Stimulation 1” tally chart. After all of the “ships” have reached the destination port bring all of the students back together and combine the ship encounter tallies from all the “right whales”.

Look at the tallies as a class and ask the students:

1. Which ships posed the greatest danger to the “right whale” students? i.e. Which ships hit or narrowly missed the right whales?
2. Did the “ships” of different sizes have different abilities to maneuver around the “right whales”?
3. Ask the “ships” that hit or narrowly missed a “right whale” why they had trouble avoiding the “right whales.”
4. Did the “ships” have enough time to avoid the whales?
5. Would it have been easier to avoid the right whales if they had some kind of warning system?

Simulation 2: Early Warning System

Hand the tally sheet back to the “right whale” students and have them redistribute in the “shipping lane”. Tell them to stay still while the other students mark an area with about a five foot radius around each “right whale” student (Note: Leave these markings in place after Simulation 2 because they will be used in Simulation 3 as well). Bring all of the students back together and explain that these marked areas function similarly to the Early Warning System.

Tell the “ship” students that when they see the marked boundary around where a “right whale” was recently seen, it is like a ship being notified by the Early Warning System. Tell the “ship’s captains” that they may choose to look up and/or slow down when they see a marked boundary. When the Early Warning System was first implemented, mariners were requested, but not required, to take extra precautionary measures when a whale was reported in their area or along their path of travel. These precautionary measures included posting extra lookouts for whales and reducing ship speed. Instruct the “ships” to resume their positions and the “right whales” to return to the middle of their respective marked areas with their tally sheet. This time, they should make their tallies in the Simulation 2 tally chart. Point out to the “right whale” students that if they are hit or narrowly missed by a “ship”, they should differentiate on the tally sheet whether the “ship” was traveling fast or slow. This differentiation is labeled on the Simulation 2 tally chart for ships of all sizes. Instruct the “right whale” students to move about as they had in Part 1. Let them know that it is their decision whether or not they stay within their marked area.
As in Part 1, have your “ship” students make a run through the shipping lane while walking fast. After all of the “ships” have reached the destination port, bring all of the students back together and combine the ship encounter tallies from all the “right whale” students.

Look at the new tallies as a class and ask your students:

1. How are the new results different from the results of Part 1?
2. Why might these results have been different?
3. Were there any ships that still posed the danger to the “right whales”?
4. Again, ask any “ships” that hit or narrowly missed a “right whale” why they had trouble avoiding the “right whales.”
5. Did the “ships” still not have enough time to avoid a “right whale”? Why or why not?
6. Were they going too fast to slow down or turn in time?

Simulation 3: Right Whale Ship Strike Reduction Rule

Explain to the students that in the last part of this activity they will simulate the conditions of the Right Whale Ship Strike Reduction Rule. Tell your students that all but the single-student ships are required to reduce their speed and slowly walk through the shipping lane. Single-student “ships” may choose their speed (slow or fast). Point out to the “right whale” students that if they are hit or narrowly missed by a single-student “ship”, they should differentiate on their tally sheet whether the “ship” was traveling fast or slow. This differentiation is labeled on the Simulation 3 tally chart. Instruct the “ships” to resume their positions and tell the “right whale” students to return to the middle of their respective marked areas. Instruct them to move around as they did in Part 1 and 2.

Have your “ship” students make a run through the shipping lane simulating the Right Whale Ship Strike Reduction Rule. After all of the “ships” have reached the destination port, bring all of the students back together and combine the ship encounter tallies from all the “right whale” students.

Look at the new tallies as a class and ask students:

1. How are the new results different from the results of Parts 1 and 2? How are they similar?
2. Why might these results have been different?
3. Were there any ships that still posed the danger to the “right whales”?
4. Again, ask any “ships” that hit or narrowly missed a “right whale” why they had trouble avoiding the “right whale.”
5. Is there anything else those “ships” could have done to help them to avoid the “right whales”?

Evaluation Suggestions:

Use your student’s participation in the reflection discussions at the end of each activity section to evaluate whether or not they understand how the results of their simulations relate to right whale conservation.

Activity based on Shipstrike Rule lesson plan by Jessica Hardy, NOAA Fisheries, Marine Mammal Education Intern, Summer 2010

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Ship Strike Tally Sheet

(Record the number of each type of ship that hits or almost hits a whale)

<table>
<thead>
<tr>
<th>Simulation 1</th>
<th>Small Ship</th>
<th>Large Ship</th>
<th>Huge Ship</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Hit&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Narrowly Missed&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulation 2</th>
<th>Small Ship</th>
<th>Large Ship</th>
<th>Huge Ship</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Hit&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Narrowly Missed&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Simulation 3</th>
<th>Small Ship</th>
<th>Large Ship</th>
<th>Huge Ship</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Hit&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Narrowly Missed&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson 17: How can we protect North Atlantic right whales?

Objectives: Students will learn about ways to minimize ship strikes and whale entanglements. Students will explore ways that they as individuals can help protect North Atlantic right whales.

You will need:

- Computers with internet access (for individual students or groups of up to 3 students)
- Copies of “Help the Right Whale Fix What’s Wrong” game student worksheet (page 17-5 and 17-6) for each student or group of students
- Copies of Right whale Incident Data student worksheet (page 17-12) for each student

Standards: CCSS.Math.Content.4.OA.A.1

Sunshine State Standards: SC.4.L.17.4; SC.4.N.1.1 (additional activity #2)

Strategy:

1. Explain to the students that today's lesson will cover threats facing North Atlantic Right Whales (and other cetaceans).
2. Have students access the Right Whale Game at the Ocean Conservancy website (http://act.oceanconservancy.org/rightwhalegame/rightwhale.html). Explain that there will be three levels to the game—if students are working in groups, they should take turns so each student plays one of the levels. All students need to pay attention to all levels so they can fill out the worksheet, and so that they will know what they need to do when it is their turn to play.
3. Give students copies of the student worksheet. Tell students to read all of the questions on the worksheet so they will know what information they are looking for as they play the game (Note: the “fact pages” in the game appear in a different order each time the game is played, so the questions may not be sequential with the version of the game the students are playing.).
4. Allow students to play the game (they should read the information on the screen before clicking “Begin Adventure.” (Note: sound is available but not required for this game.) They may need or want to play it more than once to allow everyone a turn and to make sure they get all of the information filled out on the worksheet. Allow about 15 minutes for students to play the game and complete the worksheet. If students are having difficulty finding the answers to questions on the worksheet, encourage them to click on the “Print materials” link at the end of the game (this will open a pdf document which they can read without having to print it).
5. Once all students have played the game and completed their worksheets, review with them what they have learned about threats to right whales (from this lesson and lessons 15 and 16). Ask students to tell you things that are dangerous to right whales or pose a threat to right whales and write them on the board. Also discuss with students HOW each of the items listed affects the whales and write this next to each item. Your final list/table should include the following:

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Threat | Impact
--- | ---
Ships/boats | Hitting whales and injuring/killing them
Fishing gear/ropes | Entangling whales—may drown whales, may prevent them from feeding, may cause injury/infection
Noise | Prevent whales from communicating, finding mates, mother whales may lose track of calves
Trash | May be eaten by whales—not able to be digested, not nutritious
Harassment/Annoyance | Surfers, kayakers, paddle boarders, jet skiers, and smaller vessel may annoy right whale and change their behaviors (feeding, nursing, mating, etc.), as well as put them at risk of injury. Mother and calves may be separated when trying to avoid annoyance.
Hunting | No longer a problem for North Atlantic Right Whales, but is the reason for their low numbers now

6. **Discussion/Lesson:**
   a. It might be beneficial at this point to explain a little bit about trap fishing off the northeastern US. Peak lobster fishing in the Gulf of Maine is in the summer and fall, but some lobstermen are fishing at all times of the year. Typically, commercial boats fishing for lobster set lines of traps where each trap is connected by rope to the next trap. There can be as many as 15-30 traps per line and a commercial lobsterman may set hundreds of traps at a time. Each line of traps has to have a buoy (attached by rope) at least one end, but the specific requirements vary with location. Traditionally, the ropes that were used to connect the traps would float, making a loop of rope between traps (see diagram on page 17-14). Fishermen are now required to use sinking ropes in certain areas as these sinking lines are hoped to reduce the entanglement risk to whales.
   b. Explain to students that ¾ of North Atlantic Right Whales have evidence of entanglement (scars). Mention that fishermen have complained that sinking lines are more likely to get tangled on rocky bottoms, resulting in more broken rope and abandoned traps being left in the water. The idea of a low-density rope, which would float slightly and stay off the bottom, but would not float high enough in the water column to impact whales (hopefully) is being considered.

7. Ask students if they think any of the threats could be prevented, and if so, how. Ideas could include the following:

<table>
<thead>
<tr>
<th>Threat</th>
<th>How threat could be prevented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ships/boats</td>
<td>Ships need to slow down when whales are present or avoid areas where whales gather. Observers on boats can watch for whales in the water. Buoys that detect whale calls can indicate the presence of whales in an area. Shipping lanes can be re-routed.</td>
</tr>
<tr>
<td>Fishing gear/ropes</td>
<td>Floating ropes could be replaced with sinking ropes. Regulations could be developed to reduce the number of traps or the length of the fishing season. Fishermen could be allowed to only set traps when whales are not in the area (winter).</td>
</tr>
<tr>
<td>Noise</td>
<td>Avoid some activities (e.g. drilling at sea) when whales are present in the area.</td>
</tr>
<tr>
<td>Trash</td>
<td>People can be more careful when disposing of trash to make sure it</td>
</tr>
</tbody>
</table>
can’t blow or wash into the water. People can reduce, reuse and recycle more. People can select to buy products that come in biodegradable packaging.

<table>
<thead>
<tr>
<th>Harassment/Annoyance</th>
<th>People should always stay at least 500 yards away from a right whale. If you are swimming, surfing, kayaking, paddle boarding, jet skiing or boating and you see a right whale, you should always move away immediately.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunting</td>
<td>Laws have been passed to protect right whales from hunting.</td>
</tr>
</tbody>
</table>

8. **Discussion/Lesson:**
   Explain to students that there have been some laws/regulations that have changed to help protect right whales.
   a. In 2009, the shipping channel into Boston was shifted slightly, from area where whales were found to be abundant to an area where they are less common. The change is expected to reduce the number of ship strikes in that area by about 60-80%. The change only increased the travel time for ships by 10-22 minutes. Additionally, if a right whale call has been detected by one of the acoustic buoys in the channel, ships must slow to no more than 10 knots (11.5 mph) and must post a lookout to watch for whales. All ships traveling through right whale feeding areas must also slow to no more than 10 knots at certain times of year (the dates vary by location). Although not mandated at this time, ships traveling into the ports of Fernandina, Jacksonville (FL), Brunswick (GA) and Cape Cod Bay (MA) are asked to use recommended vessel routes to reduce the risk of right whale strikes. Ships are required to slow down to 10 knots (about 11.5 mph) or less when traveling through the right whale calving area off southern Georgia and northeastern Florida between November 15 and April 15, and must also slow down in certain portions of the whales’ migratory route (between Connecticut and Georgia) from November 1 through April 30.
   b. In 2009, the federal government required the use of sinking ropes for lobster traps set in certain geographic areas.
   c. In 1997, the Federal government issued approach limits for right whales. It is illegal to approach and remain within 500 yards of a right whale.
   d. Hunting of right whales was banned in 1937.

9. **Challenge students to think of any ideas that they, their families or their communities could do to help protect whales, especially right whales.** Here are some possible ideas:
   a. Go slowly if boating in the migratory or calving area between November and April, or in the feeding areas in the spring and summer (see maps at [http://www.nmfs.noaa.gov/pr/pdfs/shipstrike/compliance_guide.pdf](http://www.nmfs.noaa.gov/pr/pdfs/shipstrike/compliance_guide.pdf)).
   b. Report right whale sightings—information about right whale locations is sent to ships traveling in the area so they know to slow down and keep a look out for the whales. In some parts of northeastern Florida, you can join a volunteer right whale sighting network (see [www.marinelandrightwhale.blogspot.com](http://www.marinelandrightwhale.blogspot.com)) or report sightings to 877-WHALE HELP (877-942-5343).
   c. Recycle fishing line and dispose of other fishing gear properly.
d. Pick up trash, volunteer for coastal/beach cleanups, or start a recycling campaign.

e. Do not approach a right whale, even if it is swimming close to shore. Remember to stay at least 500 yards away (that's more than 4 football fields in length!)

f. Raise money for right whale research, sponsor or adopt a right whale (www.neaq.org: under “Membership and Giving,” click on “Make a Donation,” then scroll down to “Sponsor a Right Whale”; www.adoptrightwhales.ca).

g. Report dead, injured or entangled whales to 877-WHALE HELP (877-942-5343).

Additional activities:

1. **Right whale mortalities** (data interpretation/math): Give students copies of pages 17-9 through 17-11. Ask students to complete the data sheet (page 17-12) using the information from this table.

2. **Lobsters vs. whales** (suggested for gifted or advanced students): Students will research how American lobster fishing in the New England region affects whales, specifically North Atlantic Right Whales. Divide students into 7 groups. Each group will be assigned a specific role: lobster fisherman, NOAA Fisheries Officer, right whale researcher, member of environmental activist group, member of local fishing coalition, ecotour operator (whale watch boat captain), state wildlife official. Each group will be tasked with using the internet to research and formulate answers to the following questions, from the perspective of their assigned role. Each group should select a spokesperson to represent them at a “public forum” (moderated by the teacher) to debate the statement, “Current lobster fishing practices are more of a threat to lobstermen than to whales.” (Remind students that they will be speaking in the “voice” of their assigned role, and not necessarily voicing opinions that they agree with.)

**Questions to be researched:**

1. What current regulations exist for commercial lobster fishermen?
2. How have these regulations changed in order to try and protect whales? How has this affected lobster fishermen?
3. What do we know about the hazards of commercial lobster fishing to whales?
4. What additional regulations have been suggested for lobster fishing? How are these likely to affect lobster fishermen? Whales?

Each group may wish to do additional research to help support their position.

*Teachers who are interested in learning more about lobster fishing might be interested in reading “The Secret Life of Lobsters” by Trevor Corson, or “The Lobster Chronicles: Life on a Very Small Island” by Linda Greenlaw.*
Name: ________________________________

“Help the Right Whale Fix What’s Wrong” game

STUDENT WORKSHEET

1. In what month do volunteers around the world pick up trash to help sea animals? _________________

2. Why is trash harmful to sea animals?
   ___________________________________________________________________________________
   ___________________________________________________________________________________

3. In the first round of the game, the whale encounters krill, jellyfish and trash. Put a check mark in the appropriate box to show what effect each of these items has on right whales.

<table>
<thead>
<tr>
<th>Object</th>
<th>Effect on right whales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Harmful</td>
</tr>
<tr>
<td>Krill</td>
<td></td>
</tr>
<tr>
<td>Jellyfish</td>
<td></td>
</tr>
<tr>
<td>Trash</td>
<td></td>
</tr>
</tbody>
</table>

4. How long can right whales grow to be? ______________

5. A right whale’s head is about _______ of its total body length.

6. About how long can right whales live? ______________

7. What color do cyamids make the whale’s callosities look? ___________

8. How are ropes that are attached to lobster traps dangerous for whales?
   ___________________________________________________________________________________

9. What are fishermen doing to reduce the risk of ropes to whales?
   ___________________________________________________________________________________

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
10. How long will right whale calves stay with their mothers?
___________________________________________________________________________________

11. How are ships dangerous to right whales?
___________________________________________________________________________________

12. How can ships reduce their threat to whales?
___________________________________________________________________________________

13. What were the three threats to right whales in this game?
   a. ______________________
   b. ______________________
   c. ______________________
“Help the Right Whale Fix What’s Wrong” game

ANSWER KEY

1. In what month do volunteers around the world pick up trash to help sea animals? ___September____________

2. Why is trash harmful to sea animals? ___Trash can choke or poison sea animals (“millions of sea animals are choked or poisoned by trash each year”).

3. In the first round of the game, the whale encounters krill, jellyfish and trash. Put a check mark in the appropriate box to show what effect each of these items has on right whales.

<table>
<thead>
<tr>
<th>Object</th>
<th>Effect on right whales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Harmful</td>
</tr>
<tr>
<td>Krill</td>
<td></td>
</tr>
<tr>
<td>Jellyfish</td>
<td></td>
</tr>
<tr>
<td>Trash</td>
<td>✓</td>
</tr>
</tbody>
</table>

4. How long can right whales grow to be? __50 feet_____

5. A right whale’s head is about __one third (1/3)__ of its total body length.

6. About how long can right whales live? __60 years________

7. What color do cyamids make the whale’s callosities look? __white____

8. How are ropes that are attached to lobster traps dangerous for whales? 
   When whales swim through the water, the lines may get wrapped around the whale’s flukes and flippers or through its mouth and baleen. This may prevent the whale from surfacing for air (i.e. the ropes drown...
the whales) and also cuts into their skin so they cannot swim as well.

9. What are fishermen doing to reduce the risk of ropes to whales? They are using ropes that sink, which are less likely to entangle the whales.

10. How long will right whale calves stay with their mothers? About one year

11. How are ships dangerous to right whales? They can hit whales, hurting or killing them.

12. How can ships reduce their threat to whales? Ships can slow down when they are in areas where whales are present.

13. What were the three threats to right whales in this game?
   a. Trash
   b. Fishing ropes
   c. Boats
# Summary of North Atlantic Right Whale Incidents, 1999-2008

Compiled using data obtained from by the National Marine Fisheries Service Office of Protected Resources’ Marine Mammal Health and Stranding Response Program, Northeast Regional Office, and Southeast Regional Office, with assistance from the Provincetown Center for Coastal Studies, New England Aquarium, and Woods Hole Oceanographic Institution.

**Information Current as of April 13, 2008**

<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>Date</th>
<th>Location First Reported</th>
<th>Alive or Dead</th>
<th>Cause of Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female (adult, 27+ yrs old) #1014 “Staccato”</td>
<td>4/20/99</td>
<td>MA (Cape Cod)</td>
<td>Dead</td>
<td>Vessel strike</td>
</tr>
<tr>
<td>2</td>
<td>Female (9+ years old) #2030</td>
<td>5/10/99</td>
<td>MA (80 mi east of Cape Cod)</td>
<td>Dead</td>
<td>Entanglement</td>
</tr>
<tr>
<td>3</td>
<td>Male (adult, 20+ years old) #1130 “Zebra”</td>
<td>3/01/00</td>
<td>MA (6 mi east of Manomet)</td>
<td>Serious injury</td>
<td>Entanglement</td>
</tr>
<tr>
<td>4</td>
<td>Male (calf)</td>
<td>3/17/01</td>
<td>VA (Assateague)</td>
<td>Dead</td>
<td>Vessel strike</td>
</tr>
<tr>
<td>5</td>
<td>Male (adult, 21+ years old) #1102</td>
<td>6/8/01</td>
<td>MA (58 mi east of Cape Cod)</td>
<td>Serious injury</td>
<td>Entanglement</td>
</tr>
<tr>
<td>6</td>
<td>Female (calf)</td>
<td>6/18/01</td>
<td>NY (Long Island)</td>
<td>Dead</td>
<td>Vessel strike</td>
</tr>
<tr>
<td>7</td>
<td>Male (adult, 19+ years old, 14m) #1238</td>
<td>11/3/01</td>
<td>Canada (Magellan Islands)</td>
<td>Dead</td>
<td>Entanglement, Danish seine gear</td>
</tr>
<tr>
<td>8</td>
<td>Female (~1 year old, 11m) #3107</td>
<td>7/6/02</td>
<td>Canada (off Briar Island, Nova Scotia)</td>
<td>Dead</td>
<td>Entanglement, inshore lobster fishery gear,</td>
</tr>
<tr>
<td>9</td>
<td>Female (adult, 14+ years old) #1815</td>
<td>8/22/02</td>
<td>Canada (Scotian shelf)</td>
<td>Serious injury</td>
<td>Entanglement</td>
</tr>
<tr>
<td>10</td>
<td>Female (~1 year old, 12.6m)</td>
<td>8/22/02</td>
<td>MD (Ocean City)</td>
<td>Dead</td>
<td>Vessel strike</td>
</tr>
<tr>
<td>11</td>
<td>Unknown (3+ years old) #3210</td>
<td>8/30/02</td>
<td>Canada (Bay of Fundy, Nova Scotia)</td>
<td>Serious injury</td>
<td>Entanglement, no gear recovered</td>
</tr>
<tr>
<td>12</td>
<td>Female (adult, 13+ years old) #2240</td>
<td>1/14/03</td>
<td>FL (Jacksonville)</td>
<td>Serious injury</td>
<td>Entanglement, no gear recovered</td>
</tr>
<tr>
<td>13</td>
<td>Female (adult, 12+ years old) #2150</td>
<td>10/2/03</td>
<td>Canada (off Digby, Nova Scotia)</td>
<td>Dead</td>
<td>Vessel strike</td>
</tr>
<tr>
<td>Sex</td>
<td>Date</td>
<td>Location First Reported</td>
<td>Alive or Dead</td>
<td>Cause of Death</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------</td>
<td>--------------------------</td>
<td>-------------------</td>
<td>----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Female (adult, 29+ years old, pregnant) #1004 “Stumpy”</td>
<td>2/7/04</td>
<td>VA (Virginia Beach)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Male (calf)</td>
<td>2/3/04</td>
<td>FL</td>
<td>Dead</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Male (juvenile, 1 year old) #3346 “Kingfisher”</td>
<td>3/17/04</td>
<td>FL (SE of St. Augustine)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>Female (adult, 12 years old) #2301</td>
<td>9/6/04</td>
<td>Canada (Roseway Basin, Nova Scotia)</td>
<td>Dead (as of March 3, 2005 on Ship Shoal Island, VA)</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>Female (adult, 15 years old; pregnant) #1909</td>
<td>11/24/04</td>
<td>NC (Ocean Sands)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>12/9/04</td>
<td>MA</td>
<td>Dead</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Female (adult)</td>
<td>1/9/05</td>
<td>MA</td>
<td>Dead</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Female (adult, 14 years old, pregnant) #2143 “Lucky”</td>
<td>1/12/05</td>
<td>GA (Cumberland Island)</td>
<td>Dead</td>
<td>Infection from previous vessel strike</td>
<td></td>
</tr>
<tr>
<td>Female (adult, 11 years old at time of injury) #2425</td>
<td>3/10/05</td>
<td>GA (Cumberland Island)</td>
<td>Serious Injury</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Female (9yrs old) #2617</td>
<td>4/28/05</td>
<td>MA (Monomoy Island)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Male (adult, first seen 1981) #1167</td>
<td>6/8/05</td>
<td>MA (Great South Channel)</td>
<td>Injury</td>
<td>Entanglement – free of gear as of 3/30/07</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>7/13/05</td>
<td>MA</td>
<td>Injury</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Female (1 yr. old) #3445</td>
<td>12/3/05</td>
<td>GA (St. Simons Island)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>Male (calf, 5.4m without fluke)</td>
<td>1/10/06</td>
<td>FL (off Jacksonville)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Unknown (calf, ~5m)</td>
<td>01/16/06</td>
<td>TX (Corpus Christi Bay)</td>
<td>Serious Injury</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Female (calf, 5.6m)</td>
<td>1/22/06</td>
<td>FL (off Ponte Vedra Beach)</td>
<td>Dead</td>
<td>Entanglement, monofilament fishing gear</td>
<td></td>
</tr>
<tr>
<td>Male (yearling) #3522</td>
<td>3/11/06</td>
<td>GA (off Cumberland Island)</td>
<td>Serious Injury</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Female (sub-adult)</td>
<td>5/18/06</td>
<td>NY</td>
<td>Dead</td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Female (unknown age, 9.6m)</td>
<td>7/24/06</td>
<td>Canada (Campobello Island, New Brunswick)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Date</td>
<td>Location First Reported</td>
<td>Alive or Dead</td>
<td>Cause of Death</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------</td>
<td>----------------------------------------------</td>
<td>---------------</td>
<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td>33 Unknown</td>
<td>8/16/06</td>
<td>Canada (Bay of Fundy)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>34 Female (adult, 14.7 m)</td>
<td>8/24/06</td>
<td>Canada (Roseway Basin, Nova Scotia)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>35 Male (adult, 22 yrs. old)</td>
<td>9/17/06</td>
<td>Canada (14m east of Swallowtail, Grand Manan Island)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>36 Unknown</td>
<td>9/27/06</td>
<td>Canada (Bay of Fundy)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>37 Male (2 yrs. old, 12.6 m) #3508</td>
<td>12/30/06</td>
<td>GA (off Brunswick)</td>
<td>Dead</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>38 Female (adult) #2029</td>
<td>3/9/07</td>
<td>MA (20 mi SE of Chatham)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>39 Female (2 yrs. old)</td>
<td>3/19/07</td>
<td>MA (Cape Cod Bay)</td>
<td>Injury</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>40 Male (adult) #1424</td>
<td>3/25/07</td>
<td>MA (75mi SW of Yarmouth)</td>
<td>Dead</td>
<td>Entanglement, originally entangled in 2002</td>
<td></td>
</tr>
<tr>
<td>41 Male (calf)</td>
<td>3/30/07</td>
<td>NC (off Avon)</td>
<td>Dead</td>
<td>Entanglement, possible vessel</td>
<td></td>
</tr>
<tr>
<td>42 Female (5+ yrs. old) #3260</td>
<td>5/8/07</td>
<td>MA (about 65 mi SE of Chatham)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>43 Unknown (calf)</td>
<td>8/5/07</td>
<td>Canada (Bay of Fundy)</td>
<td>Injury</td>
<td>Vessel strike</td>
<td></td>
</tr>
<tr>
<td>44 Female (12 yrs. old) #2645</td>
<td>1/12/08</td>
<td>MA (Cape Cod Bay)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>45 Male (5 yrs. old) #3333</td>
<td>1/29/08</td>
<td>GA (off Sapelo Island)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>46 Male (2 yrs. old) #1980</td>
<td>2/3/08</td>
<td>NC (Cape Hatteras)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
<tr>
<td>47 Female (27+ yrs. old) #1140 “Wart”</td>
<td>3/6/08</td>
<td>MA (Cape Cod Bay)</td>
<td>Injury</td>
<td>Entanglement</td>
<td></td>
</tr>
</tbody>
</table>
Name: _________________________________

Right whale Incident Data

STUDENT WORKSHEET

1. How many right whales are listed in the table? ________
2. How many years does the table cover? ________
3. What is the average number of right whale incidents per year? (Divide your answer to #1 by your answer to #2) ________ ÷ ________ = ________
   (Answer to #1) (Answer to #2)
4. How many of the whales listed are female? ________
5. How many of the whales listed are male? ________
6. How many of the whales are calves? ________
7. Use information from the incident data to complete the following table:

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number of injured whales</th>
<th>Number of dead whales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel strike</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entanglement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. What type of threat causes more deaths, vessel strikes or entanglement? _____________________________
9. What type of threat causes more injuries, vessel strikes or entanglement? _____________________________
10. Were most of the incidents in northern waters (Canada, MA, VA, MD, NY) or southern waters (NC, GA, FL, TX)? _____________________________

This activity is available online at http://stjohns.ifas.ufl.edu/sea/rightwhalecurriculum.html
Right whale Incident Data

ANSWER KEY

1. How many right whales are listed in the table? ___47____
2. How many years does the table cover? ___9____
3. What is the average number of right whale incidents per year? (Divide your answer to #1 by your answer to #2) __47____ ÷ ____9____ = 5 remainder 2 or 5 2/9 or 5.22
4. How many of the whales listed are female? ___25____
5. How many of the whales listed are male? ___15____
6. How many of the whales are calves? ___8____
7. Use information from the incident data to complete the following table:

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number of injured whales</th>
<th>Number of dead whales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel strike</td>
<td>6</td>
<td>13 (or 14 if #31 is included here—in the table it is given as entanglement, possible vessel strike)</td>
</tr>
<tr>
<td>Entanglement</td>
<td>17</td>
<td>7</td>
</tr>
</tbody>
</table>

8. What type of threat causes more deaths, vessel strikes or entanglement? ______vessel strikes________
9. What type of threat causes more injuries, vessel strikes or entanglement? ______entanglement________
10. Were most of the incidents in northern waters (Canada, MA, VA, MD, NY) or southern waters (NC, GA, FL, TX)? ______northern waters (32 of the 47)______
a) Lobster traps set with sinking rope

![Diagram of lobster traps set with sinking rope]

b) Lobster traps set with floating rope

![Diagram of lobster traps set with floating rope]
Lesson 18: Technology and North Atlantic right whales.

Objectives: Students will learn about the ways that technology is being used to study North Atlantic right whales.

You will need:

- Copies of "Kleenex the North Atlantic Right Whale" (page 18-2 to 18-3) for each student
- Student worksheets (page 18-4; one per student)
- Pencils/pens

Standards: CCSS.ELA-Literacy.RI.4.1; CCSS.ELA-Literacy.RI.4.10; CCSS.ELA-Literacy.L.4.6

Sunshine State Standards: SC.4.E.6.5

Strategy:

1. Give students copies of "Kleenex the North Atlantic Right Whale" and the corresponding student worksheet
2. Ask students to read the story and answer the questions on the worksheet.
“Kleenex” the North Atlantic Right Whale

The North Atlantic right whale called “Kleenex” was first seen in 1997. Scientists know that she has had at least six babies, or calves. When a calf is swimming with an adult whale, we know that adult is the calf’s mother. Scientists try to take photographs of the calf and the mother. They can use the right whale photo catalog to identify the mother. It is harder to figure out who the father of the calf is. The father whales do not swim with the mother and calf.

Since 1988, scientists have used arrows with hollow tips to collect small samples of skin and blubber from right whales. Scientists study the whale’s blubber to find out what types of pollutants it has been exposed to. They can collect DNA from the skin. DNA is in all living cells. It is like a map of all of the characteristics of the plant or animal. Scientists have DNA from more than ¾ of all North Atlantic Right Whales. They only take a small piece of skin—about the size of the end of a pencil. This tiny piece of skin gives a large amount of information!

Every plant and animal’s DNA is unique (one of a kind.) The DNA of a calf is similar to the DNA of both of its parents. DNA can be used to tell which whales are the parents of a particular calf. If scientists have a skin sample from the calf and its mother, they will try to use the DNA to find the calf’s father. This is how we know which whales are the fathers of two of Kleenex's calves.

In 2001, Kleenex took part in two studies. First, a small time and depth recorder was stuck onto her back using a suction cup. The scientists used a crossbow to “shoot” the suction cup onto Kleenex’s back where it stuck. After about an hour and a half, the suction cup came loose and floated to the surface. Scientists were able to collect it and download data from the recorder. This helped them learn about right whale diving and feeding behavior.

In the second study, scientists used a machine called an ultrasound machine. They wanted to find out how thick right whales’ blubber was. Kleenex was one of the whales they studied. The ultrasound machine produces a sound wave, then “listens” to the sound waves that bounce back. Waves that bounce off
different surfaces make different patterns. In a whale, the sound waves go through the blubber and bounce back off the muscle. Scientists measure how long it takes for the sound waves to bounce back. They can then estimate how thick the blubber layer is. The thinner the blubber, the faster the waves will bounce back. The blubber thickness tells scientists if the whales are healthy or not. A whale with a thin blubber layer may be sick.

North Atlantic right whales can be very large. They can measure up to 55 feet in length and can weigh more than 60 tons! It is hard to measure a whale from a boat or from land. Scientists used a special camera to measure Kleenex’s length. They attached the camera under an airplane. They also measured her girth (the distance around her belly).

Kleenex has helped with one other research project. Scientists are collecting samples of whale poop! They use dogs that have been trained to sniff out floating whale poop. The scientists scoop the sample from the water. They analyze the poop for parasites and hormones. This tells them if the whales are healthy or stressed. They can also get DNA from the sample.
Student worksheet—Kleenex the North Atlantic Right Whale

Read the story about Kleenex the whale. Kleenex has been studied by many scientists! Use information from the story to answer the questions.

1. Circle all of the different ways that scientists use to identify right whales.
   - Photographs
   - DNA
   - Skin samples
   - Blubber

2. Scientists use special equipment to measure how thick a whale’s blubber is. That equipment is called a __ __ __ __ __ __ __ __ __ __ machine.

3. If a right whale has a thick layer of blubber, is it sick or healthy? ______________________

4. Circle the correct answer. Scientists study _______ using time and depth recorders.
   a. DNA
   b. Diving and feeding behavior
   c. The length of whales
   d. Blubber thickness

5. Circle all of the correct answers. Scientists can tell if a whale is healthy by studying its ________.
   - Blubber thickness
   - DNA
   - Blubber
   - Poop

6. Fill in the blank. Kleenex has at least ____________ calves.
ANSWER KEY—Kleenex the North Atlantic Right Whale

Read the story about Kleenex the whale. Kleenex has been studied by many scientists! Use information from the story to answer the questions.

1. Circle all of the different ways that scientists use to identify right whales.

- Photographs
- DNA
- Skin samples
- Blubber

2. Scientists use special equipment to measure how thick a whale’s blubber is. That equipment is called a _ULTRASOUND_ machine.

3. If a right whale has a thick layer of blubber, is it sick or healthy?
   ___HEALTHY____________________

4. Circle the correct answer. Scientists study ______ using time and depth recorders.
   a. DNA
   b. Diving and feeding behavior
   c. The length of whales
   d. Blubber thickness

5. Circle all of the correct answers. Scientists can tell if a whale is healthy by studying its ________.

- Blubber thickness
- DNA
- Blubber
- Poop

6. Fill in the blank. Kleenex has at least ____SIX______ calves.
Lesson 19: Bringing it all together

Objectives: Students will develop a persuasive essay about the need to protect North Atlantic right whales and create and give a presentation based on the essay.

You will need:

- Writing materials
- Copies of Persuasion Map (page 19-3), checklist (page 19-4) and PowerPoint instructions (pages 19-5 and 19-6) for each student
- Computers with internet access/presentation software (e.g. PowerPoint)

Standards: CCSS.ELA-Literacy.W.4.1; CCSS.ELA-Literacy.W.4.2; CCSS.ELA-Literacy.W.4.4; CCSS.ELA-Literacy.W.4.8; CCSS.ELA-Literacy.L.4.1; CCSS.ELA-Literacy.L.4.2; CCSS.ELA-Literacy.L.4.3; CCSS.ELA-Literacy.SL.4.4

Strategy:

1. Explain to students that they will be taking all of the information that they have learned about right whales and using it to write a persuasive essay. This should be written as a letter to a government individual or agency who is in a position to impose regulations that could help protect North Atlantic right whales. (E.g. the assistant administrator of NOAA Fisheries, whose name can be found at http://www.nmfs.noaa.gov/aboutus/leadership_bios.html. The address for NOAA Fisheries Service is 1315 East West Highway, Silver Spring, MD 20910.)

2. If this is the students’ first introduction to the concept of persuasive writing, you may want to use the lesson plans at http://www.readwritethink.org/classroom-resources/lesson-plans/convince-developing-persuasive-writing-56.html?tab=1#tabs. The site provides four 40-minute lesson plans and includes activities and some online interactive resources that students can use in preparing their persuasive essay (letter).

3. An alternate (longer) persuasive writing unit can be found at http://www.pkwy.k12.mo.us/CandD/CurriculumAreas/CommArts/documents/FinalFourthGradePersuasiveWriting.pdf. This document includes a plan for a 5-week persuasive writing lesson with mini-lesson outlines, a writing assessment, a checklist for students to use when developing persuasive essay (page 26; copied here on page 19-4) and a grading rubric for the persuasive essay (page 42).

4. Guide the students in the development of their persuasive essay. Explain that they should use the Persuasion Map (page 19-2) and checklist (page 19-3) to help develop the content for their letter and presentation. An interactive version of the Persuasion Map on page 19-2 can be found at http://www.readwritethink.org/classroom-resources/student-interactives/persuasion-30034.html

5. Explain that their letter will be so convincing that they will be invited to give a presentation to the government agency/official. They will need to create that presentation, and “practice” giving it to their classmates. The information on pages 19-4 and 19-5 can be used by the
students in developing their presentations. The content of the presentation should be based on the persuasive letter.

6. Have students take turns giving their presentations to the class.
PERSUASION MAP

by: ______________________

topic: ______________________

Introduction

Main Reason 1

Main Reason 2

Main Reason 3

Facts or Examples

Facts or Examples

Facts or Examples

Conclusion
### Persuasive writing checklist

<table>
<thead>
<tr>
<th>SKILL</th>
<th>Check when completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearly identified purpose</td>
<td></td>
</tr>
<tr>
<td>Uses supporting details to back up point of view or argument</td>
<td></td>
</tr>
<tr>
<td>Lead: Opening statement introduces opinion or point of view</td>
<td></td>
</tr>
<tr>
<td>Information organized in logical order</td>
<td></td>
</tr>
<tr>
<td>Conclusion: Contains a concluding statement or summary</td>
<td></td>
</tr>
<tr>
<td>Uses <strong>persuasive</strong> words or phrases</td>
<td></td>
</tr>
<tr>
<td>Uses <strong>transitional</strong> words or phrases</td>
<td></td>
</tr>
<tr>
<td>Chooses a persuasive form specific to an audience</td>
<td></td>
</tr>
<tr>
<td>Edits for spelling, punctuation, paragraphs, mechanics</td>
<td></td>
</tr>
<tr>
<td>Evidence of revision</td>
<td></td>
</tr>
<tr>
<td>Thoughtful title</td>
<td></td>
</tr>
<tr>
<td>Neat handwriting, or presentation</td>
<td></td>
</tr>
</tbody>
</table>
How to use PowerPoint (2007 or 2010)

PowerPoint allows you to create a presentation made up of a series of slides. These slides can contain text, pictures or both.

To open the program, click on the PowerPoint icon on the desktop, or follow your teacher's instructions.

When the program opens, the screen will look like this:

This is your title slide. Click on either of the text boxes and type the words that you want to add (your title, and either a subtitle or your name and class information)

To add another slide, click on Home, then New Slide

Remember to save your presentation as you work on it. To do this, either click on the save icon (        ) or click on File, then Save. The default file name will be “Presentation1”—you will want to change that to something that you will remember (e.g. Beth whale talk).

You can add pictures to your slideshow by using the Insert tab, then selecting Clip Art or Picture. Clip Art allows you to choose from images stored in the program. Picture allows you to insert a photo that you have saved on the computer's hard drive. If you choose Clip Art, you can type in a word or words
in the search box to find the type of images you are looking for. Once you see an image you want to use, click on it and it will be inserted into the slide. You can change the size of the image. To do this, click on the image once. Use the mouse to click on one of the small circles in the corner of the image and drag it to make the image smaller or larger.

To see how your presentation will look to the audience, click on Slide Show on the menu bar, then From Beginning. You can use the right arrow, the enter key or space bar on the keyboard, or the left mouse button to move forward through the slides. To exit the slideshow, press the esc key in the top left corner of the keyboard.

Tips for creating good presentations:

1. Use large font sizes. PowerPoint will have default sizes (44 for titles, 32 for text in the body of the slide), but if you type a lot of words, the text will be smaller.
2. Don’t use too much text on a slide. You should use 3-4 bulleted points per slide. These are short, simple notes—when you give the presentation, you will explain and provide more information verbally.
3. Use a simple font, like Arial, Tahoma, or Verdana. Fancy fonts are often difficult to read. Use one type of font throughout the presentation. At the most, use one font for the title and another for the body of text.
4. Use contrasting colors for text and background (usually dark font on a light background). You can click on the Design tab to see some options for slide designs.
5. Try to keep your presentation as simple as possible.